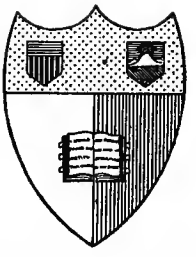

THE EDUCATIONAL MEANING OF MANUAL ARTS AND INDUSTRIES

BY

ROBERT KEABLE ROW

FELLOW IN EDUCATION IN THE UNIVERSITY OF CHICAGO, 1901—1903.
AUTHOR OF "PRACTICAL LANGUAGE TRAINING"; JOINT
AUTHOR OF "ESSENTIAL STUDIES IN ENGLISH"
AND OF THE "NATURAL SYSTEM
OF WRITING"

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TO

PROFESSOR JOHN DEWEY.

WHO INSPIRED THE WORK

PREFACE

The most vitally important and far-reaching educational movement of our time is that which aims to introduce all along the line, from the lowest primary school to the senior college class, appropriate work in various kinds of manual arts and industries, including manual training, household arts, domestic science, agriculture and the like. And yet, when one wishes to know the reasons for the movement he looks in vain for an organized treatment of the subject. In a hundred books and magazines one may find much that is valuable on this or that phase of the subject, but nowhere an attempt to relate these different aspects in a unified view. These conditions account for this book.

It would be presumptuous to assume that this brief treatment exhausts the subject, or that on any phase of the question the last word has been said. The book is put forth in the hope that it contributes something to a clearer understanding and a more judicious promotion of a great movement. It aims to help those who, like myself, are working on the problem.

For much of the general point of view presented throughout I am indebted to my former instructors in

the University of Chicago, especially to Professor John Dewey and Mrs. Ella Flagg Young. For guidance, encouragement, and direct personal help in the experimental studies my thanks are due to Professor James Rowland Angell, and for valuable criticisms and suggestions made upon the page proofs grateful acknowledgment is made to Dr. W. W. Charters, University of Missouri; Dr. John T. McManus, Chicago Normal School, and Professor George H. Tapy, Wabash College.

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CHAPTER I

The Problem of the Book

"The old order changeth, yielding place to new,
And God fulfills Himself in many ways,
Lest one good custom should corrupt the world."

Before entering upon the investigation of a problem it is only fair that the writer first make clear to the reader what the problem is, and then indicate the general line of the proposed attempt to find a solution.

Conception of the Educative Process.—Notwithstanding all that has been spoken and written regarding education, it seems probable that the great majority of persons fail utterly to comprehend the meaning of the educative process. The most common misapprehension is the confusion of schooling, scholarship, an acquaintance with books, with education. Of one person it is said, "His parents gave him an excellent education, but he has never amounted to anything. He has failed in everything he has undertaken." Another man who has proved himself unusually efficient in a calling requiring ability, sound judgment, and skill, is spoken of as "uneducated." The fact is, the first man was not educated; he was merely schooled. Possibly nature gave him little that could be educated, or the years spent over books may have unfitted him for the kind of work he might have done with success, if his schooling had been along

different lines. The second man was merely "unschooled," unscholarly. But he must have had experiences, processes of training, that developed his power to do the things in which he had succeeded. Ultimately this must be the test of education, the judgment to determine what is worth doing, and the ability to do that thing well.

There is another aspect of this misapprehension that deserves a moment's attention. To say a man was educated at Harvard, at Oxford, or at Leipsic is almost as misleading as the uses of "educated" and "uneducated" referred to above. The years spent at college may have been very important factors in the development of power and character; but other experiences quite apart from any kind of schooling, as those of the home, for instance, may have been vastly more important. In like manner, to speak of one as having "finished his education" is utter nonsense, unless he has died or become an imbecile. Accordingly a "finishing school," if true to its name, must be a horrible place.

Enough has been said to suggest our general conception of education as a *whole life process,* beginning at birth and ending at physical death, or with the failure of conscious powers. It is not only a whole life process as to time, but it involves the total experience of the organism during the lifetime—every thought, every feeling, every activity of nerve or muscle. Those who understand even the elements of educational psychology

know how every experience, that is, every thought, feeling, or act, leaves its impress upon the organism. After an activity of any kind the individual is not the same as before. This process of change is going on continuously during life, and this is the "educative process." Willy nilly we are being educated every moment, in some way, to some extent.

This does not imply that the process is uniform in rate or in significance throughout life. During the period of physical growth the organism is most plastic, most impressionable, and the process goes on most rapidly. Childhood, from birth until early adolescence, is a period of distinctly sensory and motor development; during the adolescent period there should be a marked transition to reflective activities. There is no distinction in importance; each is important in its own peculiar time. Hence, to force the young child into studies requiring much reflection is to rob him of the opportunity for sensori-motor development, and stunt his growth in reflective power, while to over-emphasize the sensori-motor training during the adolescent period is to set the interests and habits in those forms of activity. In either case there is hopeless retardation in the normal educative process.

The Most Important Educational Institution.—If we accept the view that education is a whole life process, our next question is, What starts the process and keeps it going? To some extent it may be said to have its

initial impetus in the racial instincts with which the child is born, but to this there is immediately added the efforts of the child to adjust itself to its environment. In other words, the educative process is carried on by the activity of the individual impelled by some feeling of need, a desire to get control of something valued. In play it is the need of the pleasure tone of the activity itself; in other voluntary effort it is to attain something that seems of value to the individual. In the organization of society the life activities of the vast majority of the people have centered in and about the home. The children grew up in the home, shared in its activities and responsibilities, learned the arts that pertained to providing for and making a home. After an apprenticeship, varying in length and success, the young people selected partners and started in the business of home-making for themselves. Thus the home was the first educational institution, and let us hope that it may long continue to be the most important means of education. It is exceedingly unfortunate that educators commonly talk and write as though the school were the one means of education. Parents often go a step farther, they *act* as though the school should assume all responsibility for the development of the child, physical, intellectual, and moral.

The True Function of the School.—The school is an annex to the home; the teacher an assistant to the

parents. The phrase, *in loco parentis,* often used in school legislation, in defining the duties and responsibilities of the teacher, implies the real function of the teacher and of the school. The necessity for schools has been brought about by the natural evolution of society. As the family life became extended more and more into community life, needs became more diversified and duties more complex. Parents gradually found themselves unable to meet personally all the demands for the instruction and training of their children. At first the teacher was brought into the home, or the sons (to whom it was thought special education was more important than to the daughters), were sent to boarding school. Later, several families, who could not well afford to adopt either of the above plans, combined in employing a teacher and in providing a schoolroom. Out of this cooperative school grew our free public school. Historically, therefore, the function of the school is to provide for carrying on certain kinds of training that were originally part of the ideal home life, and to extend this training in such ways as the developing community life seemed to make necessary or desirable. The public school is now an organ of society, but with its roots in the home and family life. Society's ideal of education may be higher than that of the average home in the community, but it cannot be higher than that of the best homes.

Possibly the ideal kindergarten furnishes the best example of the true function of the school. In a home where the mother has been well prepared for the duties of motherhood; has time to devote to her children; to direct, to some extent, their play; to tell and read appropriate stories; to teach simple songs and melodies; to furnish suitable occupation in modeling, drawing, painting, making; to explain some of the simple facts and processes that come under observation; for children in such a home the kindergarten is unnecessary. However, there are countless thousands of children not blessed with such a home. For the children of the untrained mother who does not know how to do the things enumerated above, for those of the overworked mother who has not time to do them, and for those of the over-leisured mother who does not realize her highest, most sacred duties and privileges, the kindergarten is an inestimable boon in that it does provide in a regular, well organized way, many of those experiences. The real test of the value of the kindergarten is the extent to which it carries on appropriately many of those activities, experiences, that should come abundantly to the life of the child in good home and community surroundings.

Aim and Motive in Education.—By an aim we understand that which one desires to do; by a motive, the reason for wishing to do it. All voluntary activity is inspired by a motive and guided by an aim. Society's

aim in establishing and maintaining schools is to prepare its immature members for the duties and responsibilities of those who will soon pass off the stage. The motive is to conserve and develop the interests of the community life. The teacher is expected to understand both the aim and the motive of society, but the child knows very little of either. His voluntary activities arise from motives and are directed by aims of his own. In many ways the child can, to some extent, project himself into the future, can see what he must be able to do in order to take his part in the life of the home and of the community, but in many others he is quite unable to do so. If the school continually imposes work for which the child has no personal motive, he becomes indifferent, inattentive, idle, lazy, irresponsible. But, if the work is of a kind that appeals to his own motives he is interested, attentive, persistent, careful; he derives satisfaction and develops a right attitude, not only toward subsequent school work, but all work that seems worth while.

As a people we are justly proud of our schools. In many ways they are excellent. But, when we congratulate ourselves into self-satisfied complaisance, close our eyes to obvious defects, or neglect to search out weakness, we are disloyal to one of our most cherished institutions. Why do so many children voluntarily leave school, if permitted, before they are fourteen years of age? Why do so many of those who remain grow in-

different and have to be spurred on in one way and another? Why are so many willing to go to "work," even though they share but little in their earning? Is it because so much "school work" does not seem worth doing? While our children cry for bread, something of value in life, are we giving them stones, things that seem of no value? Why do they turn away from the things we offer? Or, if they gather them up to display them during the recitation, they soon drop them by the wayside, because nature has provided no means by which the child long retains the information he does not use.

The Congested Curriculum.—Educators are pretty well agreed that courses of study are overcrowded, that pupils are required to do too many things, and hence the results, in both knowledge and training, lack thoroughness. They are not agreed upon what can be eliminated. Let us consider some lines of work in the elementary school course to see whether the things we are doing appeal to real motives in the children.

First, what shall we say of *geography?* When a student in high school the writer was invited to take an optional course in geography especially designed for teachers. Lesson number one was limited to the "rivers of Australia." The rest of the course was not taken, and in a few days even the names of the rivers were forgotten because he had no use for them. In years of educational work and of business he has had no use for

the facts of that lesson. To many, that will seem an extreme case, but if they will face the problem frankly they cannot fail to see that every day, in the best schools in this country, young children are being required to learn lessons that to them are as useless as the "rivers of Australia." Moreover, the course for children is not optional. The evil is further aggravated by the fact that, even in reputable schools, teachers require the pupils to learn the daily assignment in the "words of the book."

Second, let us take *history*. A good home or school environment will prompt most children to want to get some perspective of world history, and a little closer view of the growth of our own nation. In general the interest below the high school will center about a few heroes or other attractive personalities. But what is the common practice? With little or no background of earlier history, children twelve or thirteen years of age are taken through a text-book of United States history containing ten times as many details as they are expected to remember. Then both girls and boys spend a half year studying *about* "civil government," for which, generally speaking, they have as much feeling of need as a Hottentot has for Hegel.

Again, most elementary schools teach *arithmetic* every day for eight years. Children in the first grade are "drilled" daily on number facts, most of which they

would learn out of school, or would learn with a fraction of the effort a little later. Problems are given in which the children have no direct interest. Often the problems are unintelligible to the children because they have had no experience through which to interpret them. The history of the work of many children in formal arithmetic, who for some reason have come to this subject late, shows the absurdity of the usual plan. These children often get control of arithmetic in half the time usually devoted to that subject. It is the opinion of many eminent authorities that fully half the time usually spent on arithmetic is worse than wasted.

Then there is the old bugbear, *technical grammar.* At one time grammar was a high school subject; the first "grammar schools" in both America and Europe were college preparatory schools. Gradually it was forced down and down in the grades until it has been common to teach grammar during four or five years in the elementary school. Children are thereby befuddled and discouraged before they understand what grammar means. There is, happily, evidence of a reaction against this absurd condition. An enquiry made in 1908 showed that in eighty per cent of the practice departments in the state normal schools of this country the teaching of formal grammar is deferred until the second year below the high school. But this reaction is not widespread. It is probably safe to say that in a large majority of our

schools formal grammar is begun at least two years earlier than it should be. The waste of time is bad, but that is a minor evil. The development in the child of the feeling that school work is not worth while, the consequent attitude of indifference, often aversion to this subject, and more or less toward all school work, is a serious, far-reaching wrong.

Subjects Seeking More Recognition.—While these and other wasteful conditions continually stare every alert, thoughtful educator in the face, other lines of work are pleading for their rightful recognition. To leaders in educational thought it has long been clear that the work of the public schools, those schools organized and maintained for all the people, should not be limited to the three R's, or to those distinctly informational studies that have generally pre-empted the whole course. Intelligent, fair-minded business men have condemned our school work as bookish and impractical. They say that our boys leave school with anywhere from seven to twelve years of special training, acquaintance with books, but with little power to do things with their hands, notwithstanding that probably nine out of ten work chiefly with their hands the rest of their lives. Others point out that in the schooling of girls about the only things that are generally neglected are domestic science and household arts, the arts of "home-making" which ought to be the chief concern of the vast majority of women.

The Aim of this Thesis.—Assuming, without attempting to submit evidence in detail, that, in accordance with the preceding statement, more satisfactory work in several school studies could, by certain readjustments, be done in much less time, it is the aim of this thesis to show:

First, the various educational values of training in certain forms of manual arts and industries, including manual training, cooking, sewing, mending, house furnishing and decoration, school gardening and agriculture.

Second, in what part of the school course and to which classes of children this sort of training is relatively most important.

Third, what general methods of training in these lines most fully realize their educational values.

CHAPTER II

The Development of the Educational Conception of Manual Occupations

The date of the birth of manual occupations as a feature of school work has not been definitely located by writers on educational history. Probably it never will be determined. Like many other civilizing forces this one appears to have been at work for generations, if not centuries, before any one recognized its potency or the direction of its tendency.

Egyptian Civilization.—The civilization of any one of the ancient peoples is marvelously suggestive to us in this connection. Take for one example the first people known to have organized themselves into a settled nation, the Egyptians. Very early records, dating nearly 2,000 years before the Christian era, show them to have been a people of versatile power and skill. Their masonry has never been surpassed. They had a decimal system of numbers, and a system of well adjusted weights and measures. In mechanic arts we have evidence of the skill of the carpenter, the book-binder, the potter, the weaver, the glass-blower and others. In fine arts their statuary and painting, their ornaments of gold and silver, their musical instruments, their engraving, their inlaying, all bear witness to a high stage of development in these

arts and processes. How had it come about? They were without books or a literature except in a very narrow sense. What they knew of physical and natural sciences could not have been organized for purposes of instruction. The science of mathematics was in a most elementary stage.

How had these people been educated? There appears but one answer. They had developed their powers through their efforts to manipulate material things as a means of satisfying their felt needs and desires. Manual occupations must have involved a very large part of the active life of the people, must have been in a large measure the medium through which they found their problems and solved them, and hence must have been important factors in the progress of such a people.

Hebrew Education.—The civilization of the early Hebrew people was as remarkable in its spiritual conception as that of the Egyptians in its industrial and artistic power. Yet the Hebrews of that time had little literature and less science and mathematics. The boys only were taught to read and write, and this usually merely to the extent that they might read the Scriptures and understand their religious duties. The girls were taught to spin, weave and embroider, to prepare food for the table, to superintend the household work, and generally to sing and dance. Much importance was attached to the training of the boys in manual work. The majority

of them became farmers, but it is significant that an oft quoted Rabbinical saying of that time was:

> "He that teacheth not his son a handicraft maketh him an associate of thieves."

For the girls the chief means of education were the social intercourse of the family and of the community and the domestic occupations just mentioned above. The boys apparently fared somewhat better, but the point is that without book learning Jewish women became commonly the equal of their brothers and husbands, and that these limited means of education did produce a great people.

Luther.—As early as the beginning of the sixteenth century, Martin Luther, the great religious reformer, strongly urged the introduction of training in manual occupations into the schools as a means of economic and moral development. About the same time Zwingli, the Swiss reformer, made similar recommendations to his people.

Comenius.—So far as we know, however, it was John Amos Comenius, 1592-1671, who first apprehended and presented the true significance of manual occupations as a factor in education. He wrote:

> "Finally, they would learn the most important principles of what goes on in the world around them, and that any special inclination toward things of this kind may assert itself with greater ease later on.

> "The class lessons should not exceed four hours daily, of which two should be before midday, and two after. The remaining hours of the day may profitably be spent in domestic work (especially among the poor), or in some form of recreation." [1]

Francke, toward the close of the sixteenth century introduced instruction in wood working, glass cutting, and pasteboard work into his school at Halle.

Locke, 1632-1704, said every boy should learn a trade or craft, and recommended gardening, husbandry, carpentry, work in iron, brass, or silver. He also proposed a plan for a working school for poor children. The object of this school was to accustom the children to work, to relieve mothers of their care, and, at the same time, relieve the parish in part of the cost of supporting such children by giving it the benefit of their work.

Rousseau, 1712-1778, recommended that when between 12 and 15 years of age Émile should learn a trade and gave the preference to carpentry. While his plan for the education of a girl reveals a mediæval conception, it is worthy of note that Sophie should learn to sew, embroider, and make lace, to be industrious, to dance, and to sing.

Martin Planta, 1727-1772, a distinguished Swiss clergyman, who seems to have been the herald of Pestalozzi, established a school in which manual work was a

[1] Comenius. "The Great Didactic," Chapter XXIX.

prominent feature. The children were engaged in gardening, wood working, pasteboard work, and like occupations. More advanced pupils made their own apparatus for experimental and demonstration work in physical and mathematical studies.

Kinderman, 1740-1801, an educational reformer of Bohemia, first forced the question into public discussion by protesting against the limitation of the work of the elementary schools to merely supplying information, much of which could have no direct connection with the present interests or the future needs of the children, and the utter neglect of preparation for or training in the activities in which the children must later engage. He says:

> "I became convinced that this was the cause of much laziness and poverty, of unfruitful life, and of great wickedness.
>
> "Working classes and reading classes must be combined. This is the only way that industry can be made a national characteristic." [1]

As a result of his work, it is said, some 200 manual training departments were organized in connection with the primary schools of Bohemia.

Pestalozzi, 1746-1827, lays much stress upon the necessity of providing a system of manual instruction. In some of his own schools the pupils were engaged in manual occupations more than half the time.

[1] Von der Entstehung und Verbreitungsart der Industrie-Klassen in den Volksschulen des Königsreichs Böhmens.

In 1791 **Arnold Wageman** of Gottingen, Germany, wrote "Über die Bildung des Volks zur Industrie," advocating the introduction of industrial work in the schools. He says:

> "It is wrong to begin school work with direct instruction in subjects that are purely mental, and amount to nothing more than mere memory lessons, since the child has had no experience, and it is only experience that can give interest to the study of abstract subjects. It would be better to follow the hints of Nature, who allows the growth of the body in early childhood to supersede that of the mind.
>
> "We need only, unobserved by the children, to watch them at their occupations after school hours. We will soon see how we ought to busy them in the class room, in order to make their school life both agreeable and useful."

Dr. I. G. Krunitz, in 1794, published his "The Country Schools Viewed as Instructional and Manual, or Industrial, Schools," in which he strongly reinforced Wageman's position. By royal command this book was ordered to be bought by every parish in Prussia.

A. H. Niemeyer, 1754-1828, rector of the University of Halle, pointed out that the great problem of elementary education was to find an occupation suitable to each stage of development of the child.[1]

[1] Die Grundsätze der Erziehung und des Unterrichtes.

J. H. G. Heusinger, 1766-1837, the forerunner of Froebel advocated the same principles and made suggestions regarding the choice of occupations in his "Über die Benützung des bei Kindern so thätigen Triebes, beschäftigt zu sein," and in "Die Familie Wertheim."

Fallenberg, 1771-1844, established an agricultural and industrial colony on his estate, Hofwyl, a few miles north of Berne, Switzerland. A feature of this colony was known as the "Poor School," having for its motto, "Pray and Work." In this school it is said the children were chiefly occupied in the fields, in shops and with housework. Their recreation was instruction in theoretical studies.

Johann Jacob Wehrli, 1790-1855, was for many years director of Fallenberg's "Poor School." Under him the school gained such a reputation that many similar schools, known as Wehrli Schools, were established in Germany.

Fichte, 1762-1814, emphasized the importance of incorporating manual training into the national schools by positing it as the true aim of education to train the young in the line of their probable future work, hence the training should combine practical labor with theoretical instruction. Every one should be taught how to work that he may not be tempted to commit crime to satisfy his needs.

Froebel, 1783-1852, made a distinct advance upon his predecessors, not only in introducing so much in the way

of manual occupations into his kindergarten system, but in his advocacy of the *value of training in such occupations throughout the school course.* To him such occupations were more than a means of preparing for a manual trade, more than a protection from idleness, more than a training for hand and eye; they were an essential means of self-expression. Before his time, the method of the schools generally assumed that the child mind was receptive and reproductive. It was apparently taken for granted that only "what goes in can come out." Froebel made practical application of the view that mind is "productive and creative." This practice he carried into the occupations. Children were expected to think and do, to produce things different from anything that had been shown or explained to them.

Switzerland.—Another very significant fact comes from Switzerland. In 1854, a Swiss statesman named Schwindler offered a prize for the best answer to the question: *"How shall instruction in our elementary schools be freed from its present abstract method, and be made more conducive to true mental development?"* The question attracted much attention, was discussed freely in the public press, and many answers by leading educators of the time were submitted. Among the most significant were, "The Working Schools of the Parishes in their true Relation to the Elementary Schools," by Dr. Conrad Michaelson, and "Education to Work, a Demand which

Life makes of the School," by Karl Biederman. The former work was a plea for a combination of the working schools, that had been started here and there, with the elementary schools of the country, which were essentially book schools. Biederman's work was still more valuable. He based his plea for manual occupations in school on the nature of the child and upon the general physical, intellectual, and moral results of such training.

France.—In the meantime France was not lagging behind. The spirit of the Revolution infected every phase of life. In 1793 Robespierre proposed to the National Assembly a bill for a new educational scheme, prepared by Michael de Peletier. The plan aimed to instill the duty of the habit of work, not as thorough knowledge of any specific trade, but as the development of that energy and industrious activity which characterizes earnest, diligent persons. Peletier says:

> "I consider this part of education the most important, and therefore my plan of general instruction contains manual labor as its vital feature. Of all the means likely to stimulate the average child, none will produce a greater desire for activity than physical work. I would desire that various kinds of handicraft work might be introduced."

Sweden.—In Sweden we find Torsten Rudenschold, 1798-1859, an earnest advocate of manual training as

a factor in healthful development, but especially as a precautionary preparation for the needs of adult life.

The progress of the movement is more clearly seen in "The Principles for the Study of Educational Instruction," by Ziller, professor of pedagogy in the University of Leipzig, and published in 1864. A notable passage is:

> "Theoretical and practical work should, as far as possible, bear one another out. On the one hand natural science, mathematics, history, geography and drawing should offer problems to the shop, and on the other hand, the practical experiences gathered in the manual work should make book lessons the more easily learned."

Summary.—Glancing backward we can see the gradual development of the recognition of manual arts and industries as an important factor in the process of education. A new conception was, during three centuries, evolving itself in the minds of religious and moral reformers, educators, and statesmen in Germany, France, Prussia, England, and Austria. While some of these men appear to have had a quite clear and comprehensive view of the real significance of what they advocated, the general conception, and especially the more common application of it threw the emphasis upon two ideas. First, the aim was to develop a kind of manual skill or handicraft, to the poor children a means of livelihood, or of bettering their material condition in life; to the children of the

wealthy an inalienable resource in case of loss of their wealth. Second, the purpose was to train boys and girls into habits of productive industry not only for the positive moral value of such training in itself, but to avoid the corrupting and corroding influence of idleness.

When we consider how long the reform had been advocated, how widespread the movement had become, and how many reasonably satisfactory experiments had been made, it is not surprising that plans for carrying on the work were systematized and established in several countries almost simultaneously.

Finland.—In 1858, Cygnaeus, a teacher in Finland, outlined a simple course in manual training for the schools of his country, and in 1866 it was made obligatory in all elementary and manual schools. The plan was to supplement the gifts and occupations of the kindergarten, and the work included joinery, turning, and basket making, not with a view to instructing in a trade but with strict reference to the universal aim of education.

Russia.—In 1868, Victor Della Vos, Director of the Imperial Technical School of St. Petersburg, instituted a formal course in tool instruction. The Russian system had a three-fold aim: 1. To give an acquaintance with the nature and functions of the various tools used. 2. To instruct regarding the character, uses and limitations of the materials worked upon. 3. To train in planning, shaping and assembling the parts of models to be con-

structed. The system included work in both wood and iron, turning, carpentry, forging, and fitting.

Sweden.—Swedish educators claim to have had some form of Sloyd since 1850, but it was not until 1870 that this system was introduced into the primary schools of the country. To encourage its introduction a royal mandate provided for the payment of a special stipend of 75 kroner ($21) yearly to each school in which Sloyd was taught. The system is too well known to need description, but the aims set forth by its advocates are of interest, viz.: to instill a love for work, to develop habits of order, attention, self-reliance, a sense of form and a high degree of manual dexterity. Sloyd spread rapidly to Norway, Germany, Austria, Denmark and America.

France.—In 1882 the French provided for a system known as "L 'enseignement du Travail Manuel," and made it compulsory in the public schools. Provision was at once made for preparing teachers to instruct boys in bench and lathe work in wood, iron work at the forge, drawing, modeling and molding. Girls were to be taught various kinds of needlework, cutting, and dressmaking. The aim of the introduction in this kind of work was apparently economic—to fit the children of the working classes for efficient and satisfactory work such as they would probably have to do, to develop a love for work through the habit of working successfully.

The United States.—In this country, Worcester, Mass., had, in 1868, a technical school for students learning mechanical engineering. In 1870 the University of Illinois had wood working and iron working shops for students of architecture and engineering. The Stevens Institute of Hoboken, N. J., began similar work in 1871, and Washington University at St. Louis in 1872. A great impetus was given to the movement by the work of Della Vos's pupils exhibited at the Centennial Exposition in 1876. Within ten years manual training schools, or departments, were established in St. Louis, Baltimore, Chicago, Eau Claire (Wisconsin), Toledo, New York, Philadelphia H. S., Omaha H. S., Denver, Cleveland H. S., Cincinnati, Minneapolis, and many other places. Little more than a quarter of a century has passed since the first real manual training school was established in this country. According to the report of the Commissioner of Education, 1899-1900, there were in the United States 144 schools specially devoted to manual and industrial training, having an attendance of 41,736 pupils. Besides this, various forms of manual training other than drawing were taught in the public schools of 169 cities of over 8,000 population. Educational reforms usually progress slowly, but this manual training movement has been phenomenally rapid, in some cases more rapid than rational.

Conception of the Work.—While many of the early

advocates of the educational value of manual occupations seem to have had prophetic insight into its true significance, and the writings of some indicate a pretty clear intellectual conception of the broader and higher view, and while the idea of preparing children for trades has been continually repudiated, it is clear that the work under these systems, as they have been applied, has rarely risen above the idea of improving visual perception and developing manual skill. Note the expressed aims of the various systems. Hoffman says:

> "The primary object of the Russian method was to teach the child manual work, if not directly for the purpose of fitting him for a future vocation in the arts or trades, at least in order to make him more capable, in case he should select some mechanical pursuit as his future work in life.
>
> "The Sloyd has for its first object to give an indirect preparation for life by teaching branches of certain trades and by imparting general dexterity to the hand.
>
> "The object of the French system is clearly expressed in the words of the French Minister of Public Instruction: 'The love for work can only come through the habit of working, and, reciprocally, the habit of work can only come by implanting a love for it.'" [1]

[1] B. B. Hoffman, The Sloyd System of Woodworking. pp. 14, 19, 23.

In Germany and England the movement at first met much opposition from educators because it seemed to be an attempt to yoke the trade school with the school of letters.

It may seem a strange, unwarranted statement to say that in America the general conception of manual training has not been much higher or broader. Look at some of the evidence.

It was first introduced in this country into purely technical and industrial institutions, and the work was generally carried on in the same way as in a good trade school.

The next step was the establishment of special manual training high schools, or of special departments in high schools for those students who were repelled by the regular courses. Though it has been working its way down into the common schools, it is usually limited at first to one or two of the higher grades. Of the 169 cities of over 8,000 population reported as having manual training in the public schools only 24 had extended it below the fifth grade.

Later reports are more favorable. In 1906-7 there were 644 cities, of over 4,000 population, teaching manual training in the public schools, of which nearly one-half had some work below the fifth grade. But of the students taking this work only about 25 per cent are in the elementary schools.

Narrow Views.—In many cases the first qualification sought in the teacher of manual training was skill in the use of tools. Frequently that was the only educational qualification required. The first manual training school the writer knew was put in charge of a carpenter, a man who for thirty years had done nothing but build houses, a man who knew practically nothing of schools, of books or of boys. The school lived less than half a year. Perhaps this was an extreme case; it certainly was not an isolated one. Very many of those appointed to establish manual training were mechanics, perhaps good mechanics (certainly not teachers), or persons of meager education who took a course in manual training at a summer school or some other short-course institution.

But the special teacher was not alone in his limited views. City superintendents, reputed wide-awake and progressive, have confined manual training to the high school, or isolated it entirely from the other school work. or publised courses in manual occupations which indicate clearly that the work is regarded chiefly as mechanical training having no organic relation with the rest of the child's life, either in or out of school.

The kind of work usually done in the schools and proudly placed on exhibition, the talk of training "the eye to see and the hand to execute," of following "shop practice," of "practical education for the working classes" clearly revealed the conception that prevails.

Discussion of the subject commonly indicated a higher point of view, but even in discussion there was abundant evidence that manual training meant little more than manual skill.

Dr. W. T. Harris will be acknowledged by all as eminent authority. He says:

> "When we admit that the use of tools in the manufacture of articles of wood or iron is educative, we do not say much for it. . . . . But is is claimed that skill in the use of tools in these trades would be valuable to all, no matter what their employment might be. This, however, is a position that cannot be maintained. . . . . Manual training, if it includes only wood and metal work, fits only eight per cent for their vocation, and more or less unfits for their vocation a large part of the remaining ninety-two per cent of laborers." [1]

It may be said that Dr. Harris has not been much in sympathy with manual training. Then let us turn to Dr. C. M. Woodward, one of its pioneer advocates in this country. In explaining the origin and purpose of the St. Louis Manual Training School he wrote:

> "The youth of today are to be the men of the next generation. It is important that we keep their probable life work in view in providing for their

[1] The Psychology of Manual Training—Education in the Industrial and Fine Arts in the United States.

education. . . . . As has often been said, nearly all our skilled workmen are imported, our best machinists, miners, weavers, watchmakers, iron workers, draughtsmen and artisans of every description, come from abroad; and this is not because our native-born are deficient in natural tact or ability, nor because they are in point of fact above and beyond such occupations, but because they are without suitable means and opportunities for getting proper training." [1]

Again referring to the Felix Adler Workingman's School, he says:

"Unlike the manual training school proper, it is a school for the youngest children. Its course of study ends at fourteen years, just when our school begins."

Such evidence can be multiplied indefinitely, and while much may be offered in defense, it cannot affect the verdict that even in America the general conception of *manual training* has been largely limited to the idea of preparing for manual trades. That it does this, and that this is an important result, is true, but the point is that this is not the chief reason for manual arts and industries in the elementary schools.

Our aim is to show that this does not represent the

[1] The Manual Training School, pp. 289-90, 14 C. M. Woodward (1879).

most advanced theory of the manual element in education. Other educators have taken higher ground and attained a clearer, better perspective view. They rejoice in what has been accomplished and appreciate the efforts of those who have done so much to propagate manual training and household arts in the schools. They recognize that a change so great and vital could come about only by an evolutionary process, and that in this case the evolution has been phenomenally rapid. The attitude of those who have gone farther in the study of this subject, it is the purpose of subsequent chapters to set forth. For,

> "Whether manual training schools shall develop into industrial schools for the training of apprentices to the several trades, or on the other hand become incorporated into the school system as a general discipline, depends, of course, upon the answer which educational psychology finally gives to the question."[1]

[1] W. T. Harris, "Psychology of Manual Training."

CHAPTER III

Fundamental Impulses and Interests the Basis of Manual Occupations as Means of Education

Marvelous progress has been made in modes of generating, controlling, and utilizing that mysterious and subtle force we call electricity, notwithstanding the fact that we do not know the nature of the thing itself. The scientist and the inventor have studied the thing through its modes of manifestation, through what it does under varying conditions. Similarly, wonderful progress has been made in the control of plant life. From the brier rose we have the American Beauty and from the bitter astringent husk of the almond we have the luscious flesh of the peach. Yet we do not know the nature of plant life, we know it only as a force, an activity which manifests itself in various ways under different conditions.

Difficulty of Subject.—With what added force the principle here suggested applies to human life and to the study of the development of human mind! We cannot take a specimen of life or of mind, isolate it, analyze it, and definitely describe and define it. We can only observe the manifestations of the activities at different stages and amid various environments. The multiplicity and the complexity of intellectual and emotional activi-

ties, make their study supremely difficult. However, the subtle and complicated conditions of the problem must not deter the educator from attacking it and working toward its solution, for progress in the science and art of education must always be conditioned primarily by progress in the development of knowledge concerning the being to be educated.

Point of View.—American educators must have the credit for having given a great impetus to the investigation of one important phase of the problem, that most ancient department of human enquiry under its newer name of "child-study." It is true, individual students of this subject expose themselves to ridicule by unscientific methods and by hasty generalizations. Some remind one of young ducks feeding upon mush, each taking up a little lump and running to one side in the apparent belief he has the whole thing. One takes later infancy, the kindergarten period, marks off definite limits and sees in that period all the life of the individual worthy of consideration; another takes "recapitulation" and fancies he sees in every child at different stages the cave dweller, the fisher, the hunter, the shepherd, etc.; still another sees a clearly defined adolescent period freighted with dreadful dangers to the physical, intellectual, and moral life of the youth or maiden, as well as with opulent opportunities to them and to parents and teachers to develop a race of prodigies. In other words, the tendency

is to take narrow views limited to particular sections of child life, instead of trying to get a perspective view of the whole life process, so that childhood may be interpreted, not from a part of childhood, or by itself alone, but in relation to the whole life of the individual in all its bearings.

Common Errors.—As a result of imperfect views of childhood two common errors have prevailed in educational practice. First, some would set up an ideal adult as the aim of education, and try to superimpose the qualities and characteristics of that adult upon the child as early and as rapidly as possible. Second, others would accept the common characteristics of childhood, as they manifest themselves in a fairly good environment, as being natural, and therefore good, hence to be fostered and cultivated as they are and so perpetuated. The former view takes little or no account of the nature of the child, of the real potentialities with which formal education must deal in order to produce that remote ideal result. The latter fails to recognize that the impulses, attitudes, and activities *peculiar* to childhood have only a temporary value. They are good for their time and in their relation to the future, but if perpetuated are sure to debilitate or arrest growth. They are, however, of such vital importance that we proceed to give them special consideration.

Important Factors.—The prime factors in all educa-

tive processes are the impulses to activity, whether physical or psychical. They are the fundamental characteristics of life, developed and differentiated in the evolutionary process. They constitute the endowment that the child brings with him into the world which makes growth, development, education, possible. The sensory organism is predisposed to receive sensation, the brain is predisposed to receive and the mind to select and analyze stimuli; the muscles are predisposed to receive nervous discharge and to respond by contractions. All this must not only be recognized, but it must be basal in our conception of the whole educative process.

A second group of factors are the stimulations that the impulses to activity receive from the environment of the individual. These stimuli might be called the opportunities the impulses seek for their self-expression. Granted that there may be a limited range of activities in the system of voluntary muscles due to organic accumulation and discharge of nervous energy, such movements have little educative value, they rather serve as a means of distributing, equalizing energy. The great mass of activities are, directly or indirectly, responses to environmental stimulations. Without such stimulations the impulses could never become anything more than mere impulses. From another point of view, in addition to being the opportunity for the expression of the impulses, the stimulus appears as an obstruction to some

activity in the life process. If it were possible for the life process to flow on in a steady, uniform, wholly unimpeded way, there would be nothing to overcome, to control, hence no development, no education. The opposition created by the stimulus necessitates inquiry, investigation as to the nature of the obstruction, persistent effort to understand and get control of it, and finally a readjustment, a reorganization of the forces with increased power to meet subsequent new conditions.

Having taken this general view of the impulses we are prepared to consider their differentiated modes of manifestation, but for the purpose of this study we shall here limit our view to those directly relevant to manual arts and industries.

Impulse to Sensation.—Among the strongest special impulses universal to the race is the impulse to get sensation, to see, to hear, to touch. Though the last is especially marked in early childhood it is by no means limited to that or to any other period, as the familiar signs "Hands Off," and "Please Do not Handle" in exhibitions testify. The child turns his eyes toward the light to get more of the sensation. Bright colors attract and hold his attention. In a similar way he tries to locate sound. When he discovers that he has control of some means of producing sound he is likely to use his power in countless repetitions. When his hand touches an object, unless the sensation is distinctly unpleasant, he grasps the ob-

ject or presses his hand against it so as to get more contact, more sensation. A bright rattle appeals to his eye, his ear, and his hand, and therefore has a triple charm.

Motor Impulse.—Most intimately connected with this impulse to get, and the interest in, sensation is the impulse to motor activity. Besides the early movements that may be due to organic stimulations, there is from the first a tendency to set up sensori-motor coordinations, to facilitate the repetition of those stimuli that give satisfaction to the organism. This point requires no elaboration because the physical activity of the normal child is his most obvious characteristic. In fact it is only as he becomes reflective and "stops to think," that is, checks some of the larger movements, that there is any prolonged suspension of physical activity while awake.

Impulse to Play.—As these early activities, so largely instinctive, gradually come under the influence of conscious control, they have added to them other qualities, and become the means of expressing the play impulse. The child plays with his vocal organs and at the same time with his auditory sense as he coos and babbles his first syllables. He plays with the water in his bath; with a spool or a ball for the joy of the motion; with sand or clay because it yields so readily to his manipulations; with pieces of paper because they readily move and make a noise. Later he runs about in mere physical wantonness. Whether this play impulse serves the pur-

pose of developing in the young those powers which have been evolved by the race, or whether it is merely a means of discharging surplus energy does not concern us in this discussion. We cannot, however, overlook its relation to materials employed. Play, like work, must take materials as they are found, and, like work, it must adapt the materials to its peculiar needs at any particular time. Work actually reconstructs the material, divides it, and combines it in entirely new ways. Pure play transforms materials simply by the symbolizing power of the player's imagination. A block of wood is now a ship and now a street car; a chair may be a horse or a carriage or a pulpit. No transformation presents the slightest difficulty to the magic mirror of the child's imagination.

Social Impulse.—In trying to determine the normal course of growth and development we must always take into account the social life of the individual. One is always in a large measure the creature of the social medium into which he is born and in which he lives. A part of his racial inheritance is the social impulse. The young child's early interests are almost exclusively personal and social. Apart from what he is conscious of doing, it is what other members of the family or what his immediate associates do and say that interests him. It is most natural that these social interests should be important factors in the progressive development of the child's activities.

Impulse to Imitate.—The impulse to imitation, which has already been operative with the pure play impulse, finds a most convenient medium for its expression in the household and neighborhood occupations. Boys and girls are often equally interested in making bread or pies, in sewing, or in gardening. It is true these modes of activity with the young child have in them little of the spirit of work. Through imitation the children play at working, but, owing to the love of change and lack of definite purpose, progress is soon interrupted, though the impulse does not necessarily cease to operate. Attention and interest and activity are simply transferred to some other channel where this same imitative impulse continues to find expression.

Impulse to Construct.—In the normal development of the child, guided and stimulated by social interests growing out of the impulses to physical activity, to play, to imitate, there develops the impulse to make things, the producing, constructive impulse, involving more clearly defined purposes, more continued attention, more persistent effort, and yielding the satisfaction which accompanies each and all of these, but especially that which attends the tangible products of purposes accomplished.

Impulse to Experiment.—The effort to satisfy this impulse to do, to construct, to manipulate materials leads naturally to the expression of two other impulses. First, there is the impulse to investigate and experiment. Some-

times this is simply a naïve desire to see how things will act. Frequently it is a necessary element in the process of trying to work out the purposes and plans involved. Different kinds of materials must be tested and different modes of construction tried. Frequently, however, the experiment is a mere incidental episode suggested in the progress of the work, but scarcely less valuable because incidental. First-hand information is gained, and the mind kept alert and receptive by unlooked for changes.

The Artistic Impulse.—The second is still more important in connection with our subject, the impulse to decorate, the art impulse. When one comes to feel a conscious power over his materials, is aware of a degree of technical skill in working, realizes a degree of pleasure in manipulating the materials, the art impulse begins to assert itself. He wants to add decoration to his work. He wants to express his feelings of joy in his work as well as his intellectual interest in the problem involved.

Ownership Impulse.—Finally, there is the impulse to, and interest in, personal ownership, which finds its fullest expression in those things we have produced. With what wholesome pride the little girl shows the doll's dress she has made. How much more satisfaction the boy gets out of the sleigh he made than out of the one his father bought for him. He is a rare, abnormal student who seems to get any satisfaction out of the essay he has largely cribbed. That kind of thing is usually done for

prizes, or for class credits, or for public declamation. But an original piece of composition, produced because the writer has seen, thought, and felt something worth telling, "though a puir thing, his ain," is always a source of pleasure to the author. The young bride rejoices, with very commendable pride, in the pie, or cake, or, if she be especially efficient, the loaf of bread, of her "own make." The prosperous business or professional man takes vastly more interest in the products of his own flower plot, or of the fruit tree he has planted and pruned, than in the best his wealth can buy. The marvelous development of machinery for manufacturing, with all its accompanying advantages has had this disadvantage, that it has deprived the worker of a large part of the personal pride and joy he had in the work of his hands. It is not unreasonable to hope that shorter hours for the factory worker, cheaper and better transportation to suburban homes, training in manual occupations in the schools, growth of the arts and crafts idea, and development of an appreciation of the difference between machine made decoration and the work of the artist-artisan, may restore to civilized man in general, and to the city dweller especially, much of that joy in human production of which machinery has deprived him.

Unity of Impulses.—This enumeration of the impulses and interests must not be taken to imply that they exist or function in independent and discrete ways. Their

unity may be seen from two different points of view. First, they all come under the general concept of the child's impulse to activity. During consciousness the whole being continually seeks to express itself in these and many other ways. It is the same unit of life and personality that plays, imitates, constructs, and decorates. The diversity is outside the child, in the objects of the activity, in the materials used, and in the results produced.

From another point of view they must be unified in the social life of the child which so largely conditions the particular modes of activity. The impulse to locomotion, no doubt strongly instinctive as in lower animals, is stimulated by the observation of persons walking about, and by the desire to get to persons or objects by which the social life surrounds the child. The impulse to imitate comes out only in response to the observation of some act to be imitated. The impulse to do, to make things, would probably never realize itself in action unless the child saw things that had been made or, better still, saw them in the process of making.

There is also unity in the personal motives of the child. All conscious activities are directed toward the attainment of some end, something the child values.

Treatment of the Impulses.—That these impulses exist and are potent elements of human life is beyond question. The problem for the educator is, what shall be

done with them? How shall they be treated? At least four modes of treatment suggest themselves.

First.—It is possible to conceive of a scheme of education which should ignore them, take no actual account of them. It would set up the ideal character to be developed, arrange the course of instruction and training that seemed best adapted to produce that type of character, then apply these means to each child irrespective of his personality. If the child does not seem to profit by the instruction, or objects to the training, ignore the fact or impress upon him that what he likes or dislikes to do cannot be taken into account, that his parents and teachers know best what will be for his future good and he must, willy nilly, be guided by them.

Second.—Another mode of treating these impulses might be based upon the idea that in the child they are productive of no good result. His play impulse yields nothing of value, that is, it never produces anything of practical utility, or of commercial value. Nay more, it must inevitably lead to habits of idleness and immorality. The constructive impulse, it might be said, is usually rather destructive. The child simply spoils materials and tools and produces nothing of value. It is folly to give the child tools and materials until he is old enough to know how to use them to some useful purpose. Similarly, the art impulse might, from this point of view, be described as simply a means of disfiguring and wasting

material. It is impossible for a young child to produce anything of artistic value. His favorite drawings are likely to be caricatures of his friends, his paintings hideous daubs of crude color. Such practice can only give him low, distorted views of art. From such a point of view these impulses should be suppressed. Instead of allowing the child to play he should, as early as possible, have regular work adapted to his ability. Instead of building play houses and mock forts and crude boats he should be learning to read and write and spell, because, though he may have little interest in these things now, they will be useful to him later. The impulses of the child should be suppressed and supplanted by interests and habits that will be of value to him in later life.

Third.—Then again, precisely the opposite of this view might be taken. The natural impulses of the child are good, therefore they should be fostered and perpetuated. The play impulse is an expression of the instinct of the young to those activities which develop the racial inheritance of powers. When the child makes a stick symbolize a horse, a boat, or a gun, he is simply exercising his imagination, a power that will be to him not only a source of great pleasure through life, but an essential means of study whether of literature, history or science. This transforming power of the imagination should be kept alive. Human life never lacks the serious matter-of-fact work-a-day elements. Let the child continue to

indulge his childish impulses and interests to the full, and perpetuate them as completely as possible.

Finally.—To ignore the impulses named would be the same in principle as to ignore the impulse to take food, to take rest and sleep, or to seek companionship. It would be to ignore the very force of the child's being. It would fail to take account of and would allow to operate at random the most fundamental conditions of life and development. To restrain or suppress them would be analogous to impairing the digestion and restricting respiration and circulation. It would retard or check growth and result in a dwarfed individual. To indulge the impulses and perpetuate the interests of the child must produce the same result in another way. Instead of there being a progressive development, there will be a tendency to fix and make permanent interests and modes of activity that should be only transitory. It must be recognized that the normal interests and impulses of childhood are good, but that some of them have only a temporary value. If properly utilized they not only serve important present needs in the child, but prepare the way for future development. Others, such as the social impulse, the constructive impulse, and the art impulse should be perpetuated and strengthened.

This, then, is surely the answer to the question asked a moment ago, what shall we do with these impulses and interests of childhood? The impulses are essential

elements of life, differentiated, developed, and strengthened as the race has evolved. If there is to be growth and development in the individual the impulses must have expression. The transient interests of childhood are essential to the expression of the impulses. Hence these interests should be utilized, each in its proper time, to serve as the means of reaching the next stage in the progress of the child's development.

In conclusion, how can the impulses to activity generally, the impulse to get sensation, to motor activity, to play, to imitate, to construct, to experiment, to work, the social impulse, the impulse to art expression, how can each and all of these be utilized in carrying on the educative process? Is there any better way than through various forms of manual occupations? What was a necessity to primitive peoples, and has been to a large extent with the whole race should be a well-ordered opportunity for the girls and boys whom new conditions tend to exclude from both the necessity and the opportunity.

CHAPTER IV

Sense Training

Relative Value of Direct and Indirect Methods

Importance of Sense Training.—Attention has been called to the fact that the exercise and consequent development of the sense powers are fundamental impulses in the life process. If this position be accepted the question for the educator is: What methods of exercise will give fullest expression to these impulses, and best development to the powers? This question cannot be answered without a brief glance backward.

Comenius appears to have been the earliest writer on formal education to emphasize the importance of giving special attention to the training of the senses.

> "The ground of this business is, that sensual (sensuous) objects be rightly presented to the senses for fear they may not be received. I say, and say it again aloud, that this is the foundation of all the rest; because we can neither act nor speak wisely, unless we first rightly understand all the things which are to be done and whereof we have to speak. Now there is nothing in the understanding which was not before in the senses. And therefore to exercise the senses well about the right perceiving of the differ-

ences of things will be to lay the grounds for wisdom and all wise discourse, and all discreet actions in one's course of life, which, because it is commonly neglected in schools, and the things that are to be learned are offered to scholars without their being understood or being rightly presented to the senses, it cometh to pass that the work of teaching and learning goeth heavily onward and offereth little benefit."[1]

Rousseau followed in much the same strain, and suggested a special search for materials upon which to train the senses during the early years. He thinks it most unreasonable that a child under twelve years of age should be expected to exercise reason or judgment.

"The first faculties which are formed in us are the senses. These then are the first which should be cultivated; but these are the very ones that we forget or that we neglect the most. We can neither touch, nor see, nor hear, except as we are taught."[2]

Even our usually cautious, conservative, English friends have laid special stress upon this phase of development. Under "Training of the Senses" Sully writes:

"A more systematic procedure can be gradually introduced, aiming at an accurate and full knowledge of the several sense-elements. Thus in training the color sense, the educator may best proceed by

[1] Comenius. "Preface to *Orbis Pictus*."
[2] Rousseau. "Emile."

selecting first of all a few bright and striking colors as white, red, and blue. Each of these must be made familiar and its name learned. After being shown separately they should be shown in juxtaposition.... When a few elements have thus been thoroughly learned, new ones may be added." [1]

Further, under the heading, "The Object Lesson," he writes:

"After the exercise of the child in the perception of form comes the training of the senses as a whole in the knowledge of objects and their constituent qualities. The systematic development of this side of the training of the senses gives us the object lesson....The object-lesson aims at nothing beyond the training of the observing powers themselves." [1]

Further evidence may be found in still more recent writings:

"The teacher who tries to train the powers of judgment and reasoning upon incomplete and inaccurate sense-perception is like the man who built his house upon the sand. The wise teacher endeavors to build up the intellectual edifice upon the rock of well-ordered sense-percepts."

"In giving a lesson on copper, one teacher deals

[1] Sully. "Teacher's Handbook of Psychology," pp. 104, 127, 129.

with the color and then passes on to some such topic as the the method of obtaining the ore, thus appealing to one sense only, sight. Another teacher not only lets the child look at the copper, but lets him feel it, bend it, put his tongue to it, strike it, thus appealing to the sense of touch, muscularity, taste, and hearing."[1]

Indeed, apart from supplying some unorganized information, the whole theory of object-lessons as they prevailed in the schools of America and Europe a quarter of a century ago was based in part upon this idea that a height of power and alertness in sense discrimination is of prime importance to the young child, and that such ability is best developed by a course of training through special exercises.

Substitutes for Object-Lessons.—Though the futility of object-lessons has been generally recognized and the practice of giving such lessons generally abandoned in all the more progressive schools the disease, of which they were only a symptom, still prevails in many places. The eruption appears in various forms. Among some teachers it is plain, simple sense-training exercises. The children stand with their backs to the piano while some one strikes a key and the children try to guess, or judge,

[1] Dexter & Garlick. "Psychology in the Schoolroom," pp. 99. 101.

what key has been struck. Cards or beads of various shades and tints of color are given to be assorted.

The writer not long ago saw an alleged lesson in sense-training in art. A very bright, enthusiastic teacher had a class of forty or fifty children from seven to eight years of age. She stood before the class and held in her hands a number of cards about six by eight inches in size. Upon each card was mounted a cheap reproduction of some famous work of art. A picture was flashed before the children for from two to five seconds and then removed. The children were expected to name the picture and the artist, and they did it with surprising readiness and precision. What was the value of it all? *"What fools we mortals be."*

Among another group of teachers, the disease breaks out, and becomes very infectious as *"visualization"* or as an alleged system of *"mind training."* All sorts of exercises and games are devised to provide practice in taking mental snap shots of the form, size, color, and number of objects, pictures, or hieroglyphic symbols. It is the easiest thing in the world to create a high degree of abnormal interest in this sort of exercise. Only teachers of enthusiasm are likely to undertake it. The enthusiasm infects the children, and the activities involved are so superficial, and so gently graded, that the majority of children seem to succeed well in them. A spirit of intense emulation prevails and some children soon become very expert in the exercises. It is easy to test results and the method

lends itself to public demonstrations as only superficial work can. For these same reasons the method becomes epidemic for a time among a certain class of teachers who are especially susceptible to that kind of infection.

The First Problem.—The reasons for this special emphasis of sense-training are, perhaps, sufficiently indicated in the citations from various authors just quoted. To restate them briefly we may say the senses are regarded as the only outer gateways of knowledge. They bear to the mind the same relation that the mouth bears to the stomach. They are the only avenues through which the mind can get its raw material. Hence the more alert and active they become the more raw material the mind will have to work over into organized knowledge. Then it has been recognized that the sense powers may be developed to a much higher degree than is usual; that in the blind the sense of touch and of hearing become peculiarly acute because special demands are made of them; that persons engaged in certain occupations acquire the ability to make sense discriminations utterly beyond the appreciation of others. Moreover, success in many occupations depends upon the possession and exercise of some superior sense power. Then, if we grant, as I think we must, that the senses can be rendered especially active by means of special exercises devised for that purpose alone, it must appear that such training is a proper and commendable phase of education. Is it not highly de-

sirable that the gleaners of the fundamental elements of all knowledge should be made as active and efficient as possible, and that every child should have the fullest possible training of those powers that are directly necessary to success in so many of the practical occupations of life? Can there be any reasonable objection to such methods of training?

An Important Distinction.—Our effort to find an answer to these questions involves enquiry as to other possible methods of sense-training, and then a comparison of such methods with those above described. We shall find these methods by considering how sense power has been developed where these special, direct methods have not been employed. How has the race evolved its powers of sense discrimination? How does the blind man acquire his acute sense of hearing and of touch? How do men learn to grade lumber, or paper, or textiles with such precision and rapidity that their work is bewildering to the untrained onlooker? How has the painter learned to mix his colors? It is evident that the distinction between the mode of training that has produced skill in these persons, and that of the direct method employed in some of the schools, lies *in the purpose of the activity employed and in the consequent attitude of the person concerned.* In the direct method, where there are specially devised school exercises, the discrimination of sense qualities is

made an end itself, while in the indirect method, certain discriminations are necessary in order to the accomplishment of some end of direct personal interest to the one concerned. When one is trying to learn to sing a melody he has an immediate vital interest in discriminating the pitch, force, and quality of the different tones. If he has difficulty in getting a certain interval he is directly interested in hearing it played or sung over and over again until he can not only apprehend the distinction with the ear but can reproduce it with the vocal organs. When one wants to paint a tulip he must observe closely the form and relative position of the leaves and the differences in shade and tint, and his attitude toward the work is essentially different from that involved in assorting leaves or cards according to their shape or color, merely for the sake of showing that he can sort them.

Relative Values.—The relative values of the direct and indirect methods of developing sense powers may be clearly seen from several points of view.

First.—Let us consider it from the point of view of evolution. How have the powers of sense discrimination been differentiated and evolved? There seems only one answer to this question. It has been through exercise prompted by impulse and conditioned by the felt needs of the organism. The wolf, the fox, and the hunting dog scent their prey at great distances. The rabbit and the deer have large mobile ear-trumpets to enable them to

get warning of the approach of possible enemies. The hawk, flying high, has a clear eye for possible food supply upon the ground beneath. The Indian hunter discerns the call, or sees the track of certain game where the ordinary man distinguishes nothing by either hearing or sight. The sailor forecasts the weather by slight changes in the appearances of the far-off horizon, and detects the dangerous shoal by shades in the water unseen by the landsman. The miller's apprentice soon learns to grade different qualities of flour by the sense of touch, because that is part of his business. When the hunger of the wolf has been satisfied neither his nose nor his ear is alert. The sailor walking through the fields or woods, is likely to notice nothing of the flora about him. The miller whose finger tips are so sensitive to flour may be a very poor judge of cotton, woolen, or silk textiles. In all the course of normal development and evolution it does not appear that there is necessity or provision for special exercises for sense-training.

The development of the color sense among oriental peoples illustrates this point. Van Dyke says:

> "It is said that the people of India are able to perceive three hundred different shades of color not perceptible to European eyes, and it cannot be doubted that their years of association with varied hues has trained them to this keenness of vision. The detection of beauty in color is not a thing that can

be argued or learned from a book. As the handler of silk educates the sense of touch and the musician and the poet the sense of hearing, so the artist develops the sense of sight without rule or reason, and oftentimes quite unconsciously." [1]

Second.—The foregoing line of thought suggests an essential difference in the emotional attitude involved in the exercise of the senses as a means of attaining some desired end and in that where the sense-discrimination is the end in itself. In the first case the interest is directly in the qualities observed, as when one mixes colors in painting, or tests the smoothness of a piece of wood or metal he is polishing, or tunes a violin, or by taste or smell tests a substance for the development of an acid. In the second case the interest is indirect, is transferred from something else. The thing is done to please a sympathetic teacher, or to get through with it, or to excel classmates, or because the immediate social environment seems to make it a necessary part of the daily duty.

In the case of direct sense training the interest is indirect and the discriminations are more purely intellectual, while in indirect sense training the interest is direct and the intellectual activity is set going and borne along by a more or less strong emotional force.

The importance of this contrast cannot be over estimated. This is so because this direct interest, this emotional

[1] John C. Van Dyke, "How to Judge a Picture," p. 29.

attitude toward a personal end lies at the base of all rational activity. Through it the individual sets up his standard of what is "worth-while." Things that are done merely as assigned tasks and those done simply from indirect interest are all on the same plane of values, so that there can be no comparison of values, no judgment of "worth-whileness," hence nothing that makes this activity rational and that irrational.

Third.—Again it seems quite fair to infer that the character of the resultant will essentially differ in the two cases. It is a well known psychological fact that strong emotional disturbances produce distinct chemical and physiological effects upon the organism. Good humor is commonly believed to aid digestion. Intense excitement is usually followed by fatigue and weakness, often headache. Apparently authentic cases are reported of the death of infants due to poison generated in the milk of the mothers who have given away to furious anger. By analogy it may reasonably be inferred that when the sense organs are exercised with a favorable emotional accompaniment there will be a more normal kind of development, the effect will be more organic and hence *deeper* and *more permanent.* This view will account for the fact that the results of special sense-training usually appear so superficial and evanescent, while sense power developed through indirect methods are so deep-seated and abiding. A man who in early years had

been inspector of woolen fabrics in a large wholesale dry goods house and afterwards spent twenty-five years in a quite different occupation said he believed his tactile sensibility for woolen textiles of like manufacture had lost little of its acuteness. Another who had learned the blacksmith trade testified that, after twenty years spent as a traveling salesman, the different tints in the heated iron were as clear and full of meaning to him as when he was working at the trade.

Fourth.—Another difference between the two modes of sense-training in schools is found in the comparative isolation of a special sense to be exercised by the direct method, and then the over emphasis of attention to certain arbitrarily selected qualities. One aspect of the error in this point of view is admirably expressed in the following:

> "Underlying the sense-training is the recognition of the evolution of the differentiated senses out of one sense as an advance in power. From this foundation has developed much of the emphasis which has been thrown upon exercises devised to strengthen one form of sense-perception at a time. This accentuation of the functioning of one sense is opposed to the generally accepted doctrine of nervous function. The attempt to train the senses systematically in isolation gives rise to many exercises which seem to endeavor to narrow the wide

range of adjustments which are not only possible but desirable. The various kinds of images that are involved in a single perception show the futility, if not the wastefulness, of effort directed toward a conscious differentiation of the senses. It is true that the seafaring man has a training of the sight which enables him to distinguish vessels at a distance which would make them invisible to a landlubber; that the practiced ear of a Theodore Thomas will detect in one instrument the slightest variation from the standard in tone or time of that set for a hundred instruments in his orchestra, that one particular sense acts as a fundamental in this or that trade or profession." [1]

The following shows clearly another evil of the method:

"Another child who has been drilled in recognizing colors apperceives the shades of color to the neglect of all else. The professor of the new psychology wants sixty-four shades of color taught to his infant child, as if to finish up that phase of training of the senses once for all. How fine to have the child able to recognize sixty-four shades of color!

A third child, exclusively trained in form studies

[1] Ella F. Young, "Some Types of Modern Educational Theory," p 37.

by the constant use of geometric solids and much practice in looking for the fundamental geometric forms lying at the basis of the multi-farious objects that exist in the world, will, as a matter of course, apperceive geometric forms, ignoring the other phases of objects." [2]

It is clearly not the function of the elementary school to give that kind of special sense-training which is necessary to the musician or painter or to the expert in any occupation. That is a form of technical education which properly belongs to special schools or colleges, just as much as training in pharmacy, architecture, or journalism. It is the proper work of the elementary school to promote the process of the all round development of the child, without attempting to develop a high degree of skill in any one thing. The aim should be rather to leave the powers in a plastic or fluid condition which admits of further growth, because just as soon as ideas, modes of attention, or other habits, become set and fixed further growth and education is correspondingly retarded.

Summary.—To sum up this discussion; direct or special sense-training is artificial, deals with specially selected materials; is intellectual but not emotional; is superficial, tending to inhibit rather than promote thinking, and to establish habits of merely superficial observation. On the other hand indirect sense-training is

[2] W. T. Harris, "The Study of Arrested Development."

not only the normal method of the individual in the practical affairs of life; but it is the phylogenetic method by which all sense powers have been evolved; involves a direct emotional factor as well as the intellectual; admits of logical activities; has a more favorable biologic effect upon the organism; has deeper and more permanent results; is a general preparation for all possible subsequent activity and growth.

Sense-Training Through Manual Industries.—The case is so clear, that it seems like pointing a moral to call attention to the conclusion that "manual arts and industries" furnish a better means of developing the sense powers than any system of specially devised exercises. The actual manipulation of various materials, clay, sand, papers, cardboards, woods, metals, cottons, wools, silks, materials that are being worked over for the sake of some end in which the tactile qualities must be appreciated, supplies all the conditions for *desirable* training of the sense of touch. Along with these will go training in visual perception which, however, will have special emphasis in those occupations involving color, light and shade, details of form and proportion. Another accompaniment will be the training of the muscular sense in judging weight, pressure, and other forms of force. The other intellectual sense, hearing, will be appealed to much less than touch and sight, but in working wood and metals especially there will always be more or less ear

exercise which has its own signficance in the operations. It is not implied that this kind of training develops the special expert sense of touch necessary in certain trades or professions. Such training in what corresponds with the public school state of the child's development, is undesirable, because, as has already been pointed out, it tends to set in fixed habits, modes of activity that should remain fluid for later adaptations. To those who need it, this expert training should be given in the technical or industrial trades schools, which must logically follow the general introduction of manual industries into elementary schools.

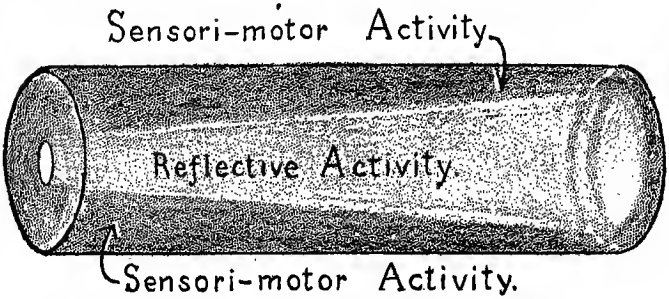
CHAPTER V

The Development of Motor Control

In Chapter III reference was made to the impulse to motor activity which manifests itself in all normal children. It is doubtful if the true significance of this impulse in the child has ever been fully appreciated in any scheme of formal education. In the fullness of the young child's activities it is obvious to the most casual observer that the sensori-motor forms largely predominate over the reflective. During his waking hours it is a matter of common remark that the child is never still a minute. We wonder at his endurance. Occasionally he *stops to think,* and gradually these partial inhibitions of the physical activity for the reflective become more and more frequent until in later life, with most persons, the reflective forms of activity exceed the sensori-motor.

If we conceive of the whole volume of sensori-motor and reflective activities of life as represented by a cylinder the relation between the two parts might be illustrated as in the accompanying diagram. There will be from the first a small central core of reflective activity in a large medium of physical activity. In a normal development of the individual the reflective life will gradually enlarge and the sensori-motor modes of activity

will relatively decrease. This does not mean that the two forms of activity are separate and independent. The fact is, they are inter-related and mutually dependent.



Two Errors.—In this connection the fundamental errors of school education have been, first, lack of a proper estimate of the relative volume of each of the two modes of activity, and second, a failure to appreciate the fact that the change of proportions is a matter of imperceptibly gradual growth.

Improvement.—During the past few years conditions in this respect have improved greatly. The teachings of Froebel, extending quite beyond direct kindergarten schools, have done much to relieve the shock which the young child of a generation ago must have felt when he passed from the free, physically active life of the home to the restraining, constraining environment of the school room. But the problem is far from being solved. The abruptness of the change demanded has been reduced but by no means entirely removed.

Where there are kindergarten schools the sudden transition required often comes between the kindergarten and the primary school, instead of, as formerly, between the home and the school. The shock and consequent retardation of growth which the seedling plant suffers when transplanted is typical, in a very small way, of the interruption of growth and waste of time and energy of the child, caused by abrupt breaks in the continuity of his life experiences.

Influence of Child Study.—If child study has established any one practical principle in education more clearly than another it is that in the elementary school the impulse to motor activity must be more fully utilized. The activity does not need to be developed. It already exists in predominating proportions. If we think of life as activity plus the power of adaptation to the end of the growth and development of the organism we shall see that the function of formal education in regard to motor activity must be to increase its power of adaptation, in other words, to blend with the activity the element of rational control. This is a psychological as well as a physiological problem.

Immediate Problem.—This division of our subject is so large, involves so many ramifications and has come to occupy so important a place in educational discussions, that it could not be treated adequately within the limits of an ordinary volume, much less within a single chapter.

For this reason only some of the essential aspects of the subject, vitally connected with our general subject, manual occupations, will engage our attention. With this purpose in mind we posit the following elements as basal in the development of motor control; the impulse *to motor activity,* under the guidance of *attention,* operating through *nerve* and *muscle.* From the outside we may estimate the degree of motor control along three lines: *accuracy* of the movements, *uniformity* and *steadiness* in continued motor activity; *rapidity* of execution. Our immediate problems are: Do manual occupations tend to develop motor control? If so, how and to what extent?

Experiments in Sawing.—To get a body of original data upon which to base our attempt to answer these questions, some simple experiments were undertaken. In general the activities involved in manual occupations are too complex to afford satisfactory material for experimental work. Three conditions are essential. The activities must admit of comprehensive observation. They must be amenable to a reasonable degree of control of the conditions involved. The results must be capable of accurate estimation. For these reasons the first series of experiments consisted in sawing cuts one inch deep in a narrow strip of inch board. The experiments were performed in accordance with the following directions:

Tools: An ordinary handsaw without a back, try-square, rule, pencil, vise.

Material: Pieces of dressed pine 12″ x 2″ x 1″.

1. From end to end upon each wide face of the board, draw a line one inch from the same narrow face.
2. Beginning one inch from the end, upon the narrow face referred to above, mark 20 points exactly ½ inch apart.
3. Through these points rule lines across the narrow face at right angles to the edges.
4. From the extremities of these cross lines draw lines at right angles to the long lines and ending in them.
5. Place the board in a vise and saw 20 cuts one inch deep from the narrow face, about 1/32 inch to the right of the guide lines. Those using the left hand will saw a like distance to the left of the guide lines. None of the pencil marks should be cut.
6. Children under 13 years of age will saw only 10 cuts a day, other persons 20 cuts a day. The whole series may be done at once, or in equal parts at an interval of one hour.
7. Each person should continue to practice until he can saw straight cuts three times out of four.

8. The date, the hour, and the number of seconds taken for the work, should be written under the group of cuts made at one time.
9. If possible, notes should be made of the changes in the attitude of the mind toward the work from time to time.

The Subjects.—In the first series of sawing experiments there were six subjects, four men and two women, all young well-matured adults, with considerable experience in experimental work. All were right handed, but to make the exercise as nearly *de novo* as possible, each used only the left hand in sawing.

No. 1 is a professor in the Department of Psychology, University of Chicago, a man who does everything with exceeding care. At the outset left hand manipulations were performed with great effort.

No. 2, a professor in the same department, is also a careful worker. To him left hand co-ordinations seemed at the start somewhat easier than for No. 1.

No. 3 is a woman graduate student. For some days before taking the exercises she had been constructing some apparatus that required considerable sawing. To rest her right hand she had done some sawing with the left, and so had acquired a degree of skill in left hand sawing to begin with.

No. 4, also a woman graduate student, had done

considerable sawing, but the left hand work was to her entirely new.

No. 5, a graduate student, laid special stress upon precision.

No. 6, also a graduate student, aimed to combine speed with accuracy from the first.

The first four sawed ten cuts, and after an interval of an hour the other ten of that day's exercise. Nos. 5 and 6 sawed the twenty cuts each day without a rest. All the exercises for each subject were taken at about the same time each day, between three and five o'clock in the afternoon. Except in the case of No. 4 the practice was taken as nearly as possible on consecutive days. The work of No. 4 was purposely done at longer and less regular intervals.

Objectively, it was evident the attempt to set up new co-ordinations required unusual effort. There was a high degree of rigidity throughout the whole body, the legs were set as braces, the right hand grasped tightly the piece of wood being sawed, the mouth was usually set, and the eyes watched closely the progress of the work. The last named condition was especially noticeable in those who made the practice most effective. In other words, *the more concentrated the attention the more rapid the development of control.*

The accuracy of each cut was quantified by means of a specially prepared millimeter scale. The possible value

of each cut was 10 points, 2 for the horizontal direction, 3 on each side for the vertical direction, and one on each side for precision in cutting just to the limiting line. One point was deducted for each deviation of a millimeter from the guiding line.

The following table shows the day of the month on which each exercise was taken, the estimated accuracy of each cut, and the time, in seconds, for each cut.

No. 5 made very little progress in accuracy, in fact he reached the maximum in that respect on the first day, but it will be noticed that he worked very slowly until the last day when he was reminded that in the end the time element was of distinct importance. Then he showed he could very much lower the time without sacrificing accuracy.

The exceptional record of No. 4 is suggestive because there appeared to be no other reason for the lack of improvement than the irregularly long intervals between the periods of practice.

The significance of the results of this series can be seen at a glance from the accompanying chart. The accuracy curve has risen steadily with only one deflection from 61 to nearly 82 and the time curve has fallen, abruptly at first, and then steadily from 300 to 110,

Note.—Readers who are interested in results rather than in the experiments should turn to page 101.

Subject No. 1			Subject No. 2			Subject No. 3			Subject No. 4			Subject No. 5			Subject No. 6		
Date	Accuracy	Time	Date	Accuracy	Time	Date	Accuracy	Time	Date	Accuracy	Time	Date	Accuracy	Time	Date	Accuracy	Time
10	47	240	12	52	240	13	54	360	12	44	225	12	92	600	12	53	360
10	64	200	12	69	180	13	61	320	12	52	215		86			60	
12	70	180	13	83	210	14	61	330	14	51	210	13	91	410	13	66	255
12	71	185	13	72	180	14	51	180	14	48	240		89			70	
13	71	195	14	78	210	17	72	310	17	42	180	14	89	360	14	63	270
13	62	210	14	84	150	17	72	195	17	44	165		96			66	
17	70	165	17	87	165	18	65	180	20	52	160	18	93	300	17	73	180
17	65	130	17	78	150	18	71	230	20	60	135		97			88	
18	76	135	18	79	165	19	82	210	23	66	180	19	89	360	19	85	108
18	84	110	18	79	140	19	79	195	23	54	135		95			85	
19	74	130	19	80	130	23	73	165	30	56	160	20	96	180	20	76	150
19	80	108	19	83	125	23	90	160	30	56	120		94			83	

Table I, showing increase in percentage of accuracy and decrease, the number of seconds of time for each of six subjects in twelve tests in sawing with the left hand.

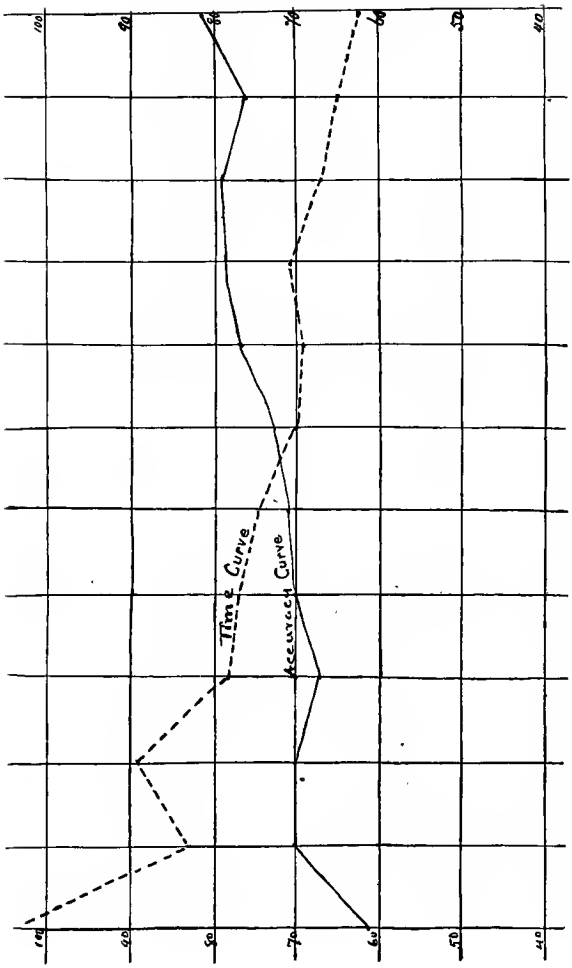


Chart I, showing the average rise in accuracy, and the average lowering of the time for the six subjects in twelve tests in sawing with the left hand.

A New Problem.—The introspections reported indicated a varying sense of uncertain struggle, with decided fatigue at the end of each test, gradually giving place to confidence and comparative ease.

At the end of the six days' practice all except No. 6 felt they could saw as well with the left hand as with the right. There remained, however, one common disability, a pronounced tendency to grip the saw handle, with the result that the hand, and more especially the fingers, were fatigued in from two to three minutes, though the general bodily tension and the unnecessary strain in the arm had disappeared.

It then appeared possible that this element, gripping the instrument, might be vital to the whole matter of manual motor control. A new problem had arisen; to devise some method of measuring the force with which the instrument is grasped in different stages of the process of gaining such control.

The Dynamometric Sawhandle.—After considerable experimenting a sawhandle was constructed involving the principle of the hand dynamometer. The essential feature of this handle is that the part grasped by the hand is made of a heavy piece of rubber tubing sufficiently reinforced to secure a satisfactory balance between the degree of strength and rigidity necessary to resist the push and pull effort of sawing, and the degree of sensitiveness to the gripping of the fingers.

The construction is shown in Fig. 1. The bottom of the tube constituting the hand grasp was closed by a rubber stopper cemented in to make it water-tight. Into the upper end of the rubber tube was inserted and cemented a brass tube which extended upward through the wood of the handle. To this brass tube a small, rather firm rubber tube was attached, the other end being connected with a tambour adjusted to register upon an ordinary kymograph.

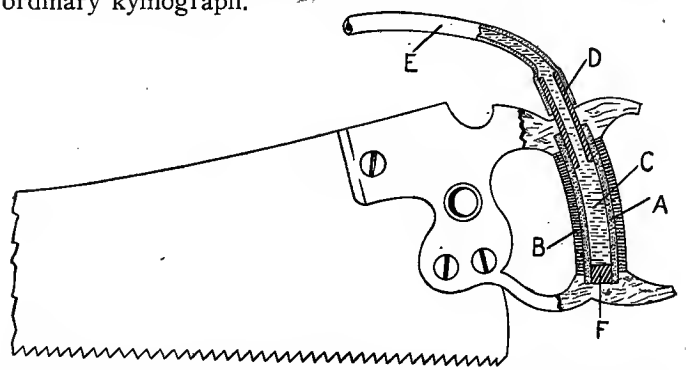


FIG. 2.—Shows cross section of dynamometric saw handle. *A*, stiff rubber tube; *B*, reinforcing rubber tube; *C*, space filled with water; *D*, brass tube; *E*, small rubber tube filled with air; *F*, water-tight plug.

A Precaution.—Before using the apparatus each day the cavity C in the handle was filled with water at about 100° Fah. to prevent much variation in temperature due to heat from the hand. The temperature of the room was kept as nearly as possible at 70° to prevent expansion or contraction of the air in the apparatus. This precau-

tion was necessary because it was found that a rise or fall of one or two degrees in the temperature of the air of the room resulted in a considerable movement of the pointer.

The Subjects.—Ten subjects took the exercises with this saw, eight boys from twelve to thirteen years of age, one professor (No. 1 of the first group of subjects), and one graduate student. Only six of the boys completed the regular series, sawing ten cuts a day for six days. All these boys were right handed and used only the right hand in sawing the series. All except No. 11 had had considerable manual training.

No. 7, rather underdeveloped physically, below normal in coordinating power and in continuity of attention.

No. 8, well developed, stocky, attentive, careful and persistent in effort.

No. 9, very tall, slight, rather below normal in muscular development, intellectual rather than motor, but painstaking in effort.

No. 10. well developed, has good motor control, but is a little impulsive.

No. 11, underdeveloped, weak in both mental and physical control, attention wandering.

No. 12, slightly undersize, but in fair physical condition, very impulsive and spasmodic.

Table II shows the results for each boy, and Chart II the average result for the group.

No. 7			No. 8			No. 9			No. 10			No. 11			No. 12		
Date	Accuracy	Time	Date	Accuracy	Time	Date	Accuracy	Time	Date	Accuracy	Time	Date	Accuracy	Time	Date	Accuracy	Time
9	47	90	8	78	90	25	72	84	25	55	75	4	53	120	3	75	105
10	52	90	9	83	75	29	71	90	29	75	75	5	54	120	4	65	90
11	52	120	10	78	120	2	77	90	2	71	90	8	53	135	5	68	90
16	61	90	11	90	100	3	82	90	5	77	84	9	42	150	8	79	75
17	69	90	12	95	90	4	87	75	8	76	75	10	64	120	11	75	80
18	75	75	14	97	75	5	92	60	9	89	72	11	62	120	12	79	75

Table II, showing increase in percentage of accuracy and decrease in the time for six boys sawing with the right hand.

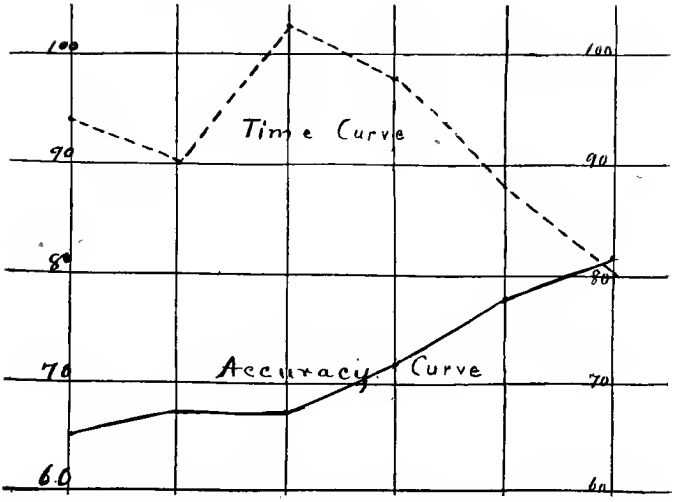
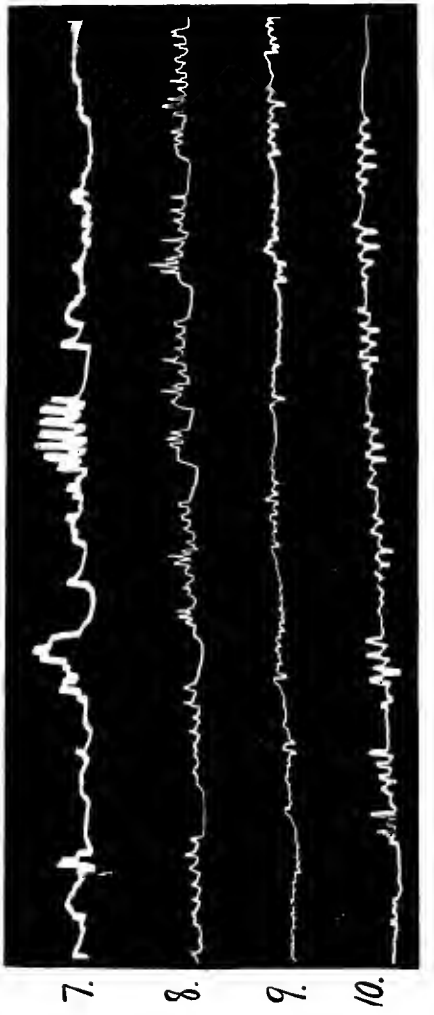


Chart II, showing average increase in accuracy and average lowering of time for the six boys reported in Table II.

For each of these six subjects, as well as for the others of the groups, records were taken on the kymograph showing the degree of, and fluctuations in, the hand grip during the progress of the exercise. Plate I gives typical examples of the records of the work of the boys sawing with the right hand. To interpret the tracings it is necessary to know that in each one the more pronounced wave represents the actual sawing, the slight wave or nearly straight part of the line indicates the interval between finishing one cut and beginning the next.

The tracings indicate clearly the way in which the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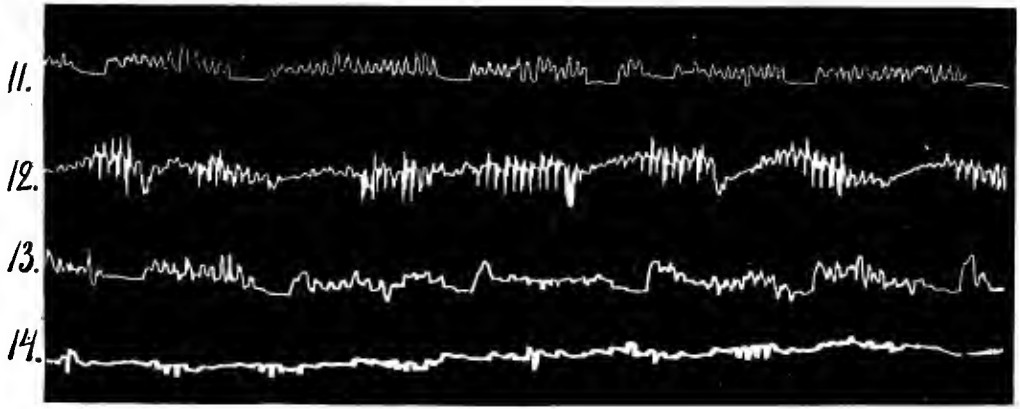


Plate I, showing precisely the varying degrees of motor control of eight boys. The height of the waves indicates the degree of finger grip. Notice the easy, steady control of numbers 9 and 14 and the unsteady, strong grips of numbers 7 and 12.

work was done.

The numbers correspond with those used in Table II.

No. 7 exercised, for the most part, a comparatively light grip but occasionally put in a spasmodic effort. The whole may be described as below the average in muscular tension and decidedly irregular. So far as could be judged attention and interest ran in much the same irregular way as the curve of muscular tension shown here. His gain in control was slow.

No. 8 applied steadily a quite firm grip, and watched the work with close attention. By referring to Table II it will be seen he attained the highest record in accuracy and a good time record.

No. 9 worked easily and steadily. The slight rise in this curve, and that more marked in 10 and 14, was probably due to temperature change rather than increased pressure.

No. 10 applied about the same pressure as No. 8, but worked with more vigor, hence the increased amplitude of the push and pull wave.

No. 11 was as feeble as his tracing indicates. There was little energy, little attention, little progress.

No 12 worked with much vigor, but with some irregularity. His ordinary activities were commonly as impulsive as these tracings indicate his sawing to have been.

No. 13 lacked attention and tension in his effort. His

progress in the development of motor control was always slow.

No. 14 had unusual control of the use of tools, and worked with ease and steadiness. His attention accompanying constructive activities lacked nothing in concentration or continuity.

A third series of exercises was even more interesting and perhaps equally significant. These exercises were taken for the sake of comparing the extent and kind of effort involved in sawing with the right hand and with the left hand. The results are clear in Plate II. In every case when the change is made from right to left hand there is a distinct rise in the curve and marked increase in the irregularity, implying at least twice the energy in the hand and a marked deficiency in control.

In the case of those to whom the left hand exercise was entirely new the discharge of energy manifested itself throughout the whole body. There was general rigidity of the trunk and limbs, the unused hand was clenched, the mouth was set (open or closed), the right arm accompanied the left in the push and pull movement, even the breathing was explosive. The whole activity was an exemplification of what Baldwin calls the "excess discharge" which attends the setting up of new co-ordinations. The tracings are, for the hand, graphic records of what was taking place throughout the whole motor system.

Plate II, showing the difference in degree of tension and of control in sawing with the right hand and with the left.

As the practice continued this difference between the energy in the right and left hand work almost entirely disappeared. It was nearly two months from the time No. 1 took the first series of exercises until he took his second series. At the beginning of the second series he felt that his left hand had lost nearly all its power to control the saw. In three practice periods of the second series, that is, in half the original amount of practice,

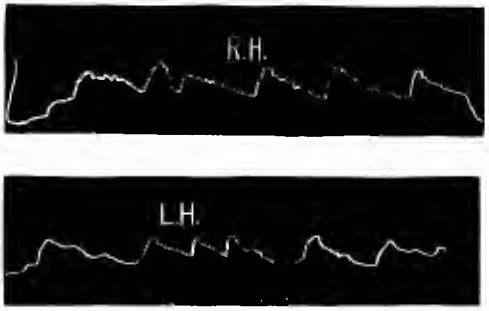


Plate III.

it regained all it had lost. Plate III shows how nearly the left hands had attained to equal ease and control with the right on the fifth day's practice in the second series. None of the boys in the brief practice given attained the same degree of relative skill and facility with the left hand as compared with the right.

One other characteristic of many of the curves is worthy of note. There was a very pronounced rise when placing the saw and beginning the cut, then a quite regular but rapid fall. This was most marked in the cases of careful workers.

One boy, No. 9, took a series of exercises in boring with a brace and bit. A good brace with straight, firm bit adjustment, and a ⅜-inch bit were used. The material was a piece of 2 x 4 inch clear pine, dressed on all sides. Lines one inch apart crossing one another at right angles were ruled on both of the wide faces so that the points of intersection on one face came directly opposite those on the others. The aim was to start the point of the bit on the point of intersection of two lines on one side and so guide the instrument in boring that the point of the bit would emerge on the opposite intersection point, and to do so as rapidly as possible. In other words, the purpose was to bore as straight and as rapidly as possible. Ten holes were bored in the forenoon and ten in the afternoon, as nearly as possible at ten and at three o'clock. The wood was fastened in a vertical position in a vise and was not moved during an exercise period.

As will be readily understood this was a much more difficult operation than the sawing, especially the effort to control the up and down variations in the direction of the bit, as the subject was not allowed to view the instrument from the side. The development of control, though less rapid than in the sawing exercise, was quite obviously regular and fairly rapid. There was a gain of nearly 30% in both accuracy and time. The result is shown in Chart III.

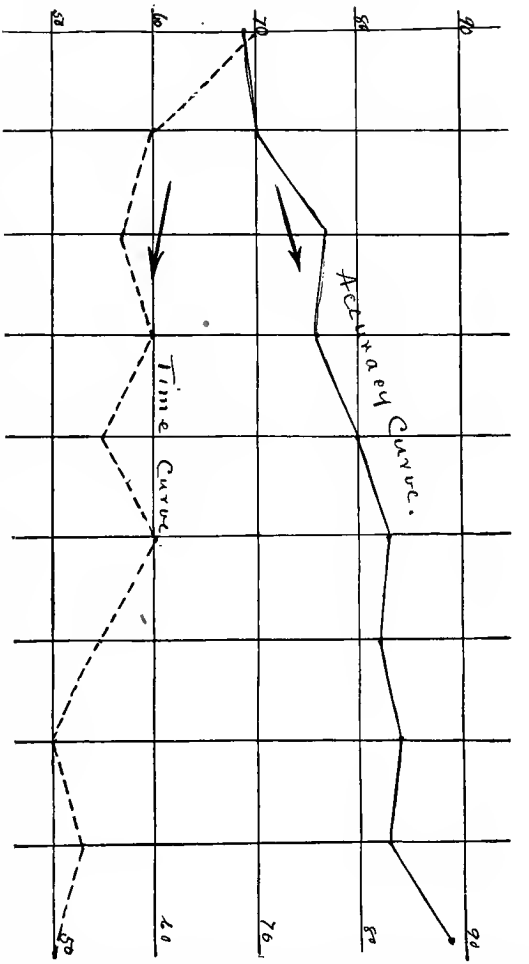


Chart III, showing increase in accuracy and decrease in time in the boring experiment.

Note. 1. An attempt was made to conduct a series of exercises with small chisels but it was found so difficult to control the conditions and measure results that the experiment was abandoned.

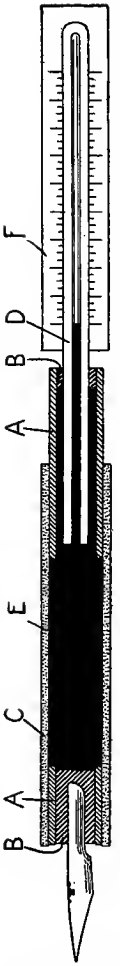
CHAPTER VI.

Development of Motor Control (Continued)

Another Problem.—The experiments with the dynamometric saw suggested that the same line of investigation might be applied to the development of motor control in learning to write.

A penholder was constructed involving the same principles as the dynamometric sawhandle. A piece of rather rigid but thin brass tubing ¼ inch in diameter and 3 inches long was used as the foundation of the instrument. About ½ inch from one end the sides of this tube were filed away leaving only a narrow rib of metal about ⅛ inch wide at the front and back of the tube. These openings extended 1½ inches up the tube, Fig. 2.

Just below these openings the tube was sealed. The remaining whole sections of the tube top and bottom were covered with tight fitting rubber tubing cemented on and then a larger piece of rubber tubing 2½ inches long was drawn over the whole from the bottom to within ½ inches of the upper end. This was cemented to the under rubber. The lower end of the tube, below the plug, was left open for the purpose of fitting into it a pen, a short pencil or a piece of common school crayon as desired. The tube was then filled with a colored fluid and into it was inserted and sealed a glass tube of small



bore about 6 inches long. The colored fluid was forced up so as to be visible in the glass tube. A millimeter scale was adjusted to the glass tube so that the rise of the column of fluid could easily be read.

This device gave a holder for pen, pencil or crayon, having the part where the fingers grasp the instrument collapsible, and the very slightest pressure was clearly indicated by a rise of the fluid in the tube.

Minor Problems.—In the series of experiments in writing several problems appeared.

1. Is there any relation between the tendency to grip the pen, pencil or crayon and the progress of development of motor control?

2. With which of the three instruments is muscular and nervous tension greatest?

3. Does it make any difference to the degree of tension whether the learner uses a fine pen or a coarse one, a blunt pencil or a sharp pointed one?

4. What is the relative tension involved in the three modes of writing with pen or pencil: (a) with both hand and arm

FIG. 3.—Section view of dynamometric pen. *A*, brass tubing; *B*, water-tight plug; *C*, stiff rubber tubes; *D*, glass tube; *E*, colored fluid: *F*. scale.

resting on the desk, (b) with arm resting but the hand entirely unsupported, (c) with both hand and arm unsupported?

5. What is the relation between the tension exerted by young children, eight or nine years of age, as compared with that of children from twelve to thirteen?

Test of Tension with or Without Rest.—In the first series of experiments in writing only a rather broad smooth pen of medium flexibility was used. The three methods of writing enumerated in problem (4) above were employed in the order given each for one minute of continuous writing with a brief rest interval between the successive tests. Six readings of the measure of tension were taken during the minute, as nearly as possible at intervals of ten seconds. In cases where the subject seemed embarrassed by the unfamiliar instrument some preliminary practice was allowed before taking the test.

Subsequently, similar tests were taken successively with a fine pointed pen, a broad soft pencil, a hard sharp pencil, and with a piece of ordinary crayon. The subjects were all boys, Nos. 9, 10 and 11, being the same as those in the sawing test.

Table III gives the results of the five series of exercises. In the first series, for the purpose of showing the variations and general trend of the reading in each trial, the six readings for each subject are given in detail. Where the variation is very wide, it will be noticed that it is usually a fall as in No. 15. This is accounted

for by the fact that these particularly low readings were taken at instants when the pen was off the paper and the tension consequently relaxed. On the other hand, there was an occasional spasmodic increase of tension especially by a subject of low motor development. These seem to represent impulsive struggles to get control.

It will be understood, of course, that these readings are purely relative within the series of tests made; no attempt having been made to reduce them to standard units.

As side lights upon the results of these experiments the ages of the subjects are given, and records of hand dynamometer and tapping tests are added. The strength of the grip of the hand is expressed in kilograms. The tapping tests were taken with an ordinary self-registering counter, having a rather stiff spring. The first record is the average for three successive trials of 10 seconds each, the second is for a minute trial.

The next group of subjects comprised eight children, four being nine years of age and four eight years of age. With the exception of No. 21, the eight-year-old children had had very little practice in writing, especially with pen or pencil. Nos. 17 to 21, inclusive, represent girls and the other boys. These children were required to write successively with five different instruments as indicated at the head of Table IV. With each of the first four, they wrote in the three ways; namely, (1) with both hand and arm resting upon the desk, (2) with

No. of Subject	Age	Strength of Grip	Tapping Test	SIX READINGS IN WRITING TEST NO. 1						Writing Test No 2	Writing Test No. 3	Writing Test No. 4	Writing Test No. 5
9	13	31	41	5	6	7	8	4	5	5.6	6.5	6	7.5
			180	1	0	1	2	2	1	1	3.3	3.5	4.3
				0	1	0	1	1	0	.5	1.8	1.2	2.2
10	13	38	42	10	20	15	18	20	16	16.5	18.7	15.5	19.2
			199	10	18	20	15	18	14	15.8	16.5	16.2	17.5
				12	15	12	15	10	12	12.3	15.2	14.2	16.7
11	13	21	32	10	5	8	10	8	5	7.7	8.3	6.8	8.5
			140	5	8	4	7	8	8	6.7	6.5	7.5	6.8
				4	5	3	4	5	2	3.8	4.7	4.3	5.2
14	13	30	40	15	15	15	18	16	18	16.3	18.5	15.7	17.3
			192	10	12	20	14	12	10	13	14.7	14	13.2
				18	20	18	20	18	18	18.7	17.2	14.5	12.5
15	13	23	32	20	30	10	35	40	30	27.5	31.3	26	28.3
			145	20	30	40	30	35	30	30	28.5	24.3	27.5
				30	20	20	10	20	15	19.2	23.2	21.5	24.2
16	15	39	41	60	50	60	60	60	60	58 3	57.5	48.5	57.5
			175	30	40	35	42	35	35	36.2	42.7	43.5	52.3
				20	30	30	30	40	30	30	33.5	35.7	45

Table III. In the column under writing tests the first line of figures for each subject show the degree of grip with both hand and arm rest, the second with the arm resting but the hand free, the third with both hand and arm unsupported.

the arm resting but the hand unsupported, (3) with both hand and arm unsupported. Then a fifth test was made in writing upon the blackboard.

As in the preceding series six readings of the tension were taken in each case, and the average has been placed in the table. The three lines of figures opposite each subject number represent the three modes of writing enumerated above. Comparing these three lines in each case it will be seen that free-arm writing involves less finger grip on the writing instrument than any other method, and that when the hand as well as the arm rests the tension is greatest.

Similarly comparing the five columns, it will be seen that the easiest means of writing for these children was with crayon upon the blackboard, and that the muscular tension is much greater when writing with either a fine pen or a sharp, hard pencil than with a broad pen or broad, soft pencil.

A final series of exercises was devised as a simple test of the relative fatigue resulting from five minutes continuous, rapid writing, first, with pen upon paper, and second, with crayon upon the blackboard. The matter written was in all cases a short sentence,and each subject wrote the same sentence in each test. All were instructed to write as rapidly as possible consistent with legibility. The dynamometer test was taken immediately before each writing exercise and again immediately after the writing. The results are given in Table V.

Subject	Age	Strength of Grip.	Average with Broad Pen	Average with Fine Pen	Average with Broad, Soft Pencil	Average with Sharp, Hard Pencil	Average on Blackboard	Character of Writing
17	9	15	27.2 18.6 16.3	31.3 24.5 18.9	24 18.2 15.5	31.5 26 6 17.2	7	Fair
18	9	14	33.3 26.2 15	34.6 28 20.3	31.2 27 14.6	35 31.6 21.9	12.5	Good
19	9	13	9.9 8 11.3	15.2 11.6 9.3	14.9 10.3 8.2	11.5 11.6 10.2	8	Poor
20	9	13	45 46.3 26.3	44.5 42.3 31.2	41 38.6 31.6	39.6 34.5 34.9	16.3	Poor
21	8	16	15.9 11.6 10.9	16.9 14.5 9.6	14.5 12.2 9.9	15.6 13.2 9.2	7	Good
22	8	14	7.9 4 5.9	10.6 7.5 6.2	8.5 7.3 5	11.5 6 7.2	6	Good
23	8	14	12.5 14.3 11.5	14.6 13 13.2	12 10.2 10.3	13.6 11.5 12.3	14	Fair
24	8	13	40.5 42 48	42.3 48 44.2	37.3 41.5 36.6	41.5 38 38.5	24	Poor

Table IV. Showing the comparative muscular tension in three modes of writing with four different instruments, and in blackboard writing. See opposite page.

Subject	Age	Pen Writing Strength of Grip.		Blackboard Writing Strength of Grip.	
		BEFORE	AFTER	BEFORE	AFTER
7	13	28	25.5	28	26
8	13	25	19.5	25	22
9	13	31	30	31	28
11	13	23	18.5	23	20
14	13	30.5	25	30	28
15	13	24	21	24	23
17	9	18	17	15	15
18	9	19.5	19	19	18
19	9	20	15	18	15
21	8	16	14.5	16	12.5
25	8	17	15	15	15
26	8	23	20.5	23	21

Table V, showing relative fatigue resulting from five minutes continuous pen writing and five minutes blackboard writing.

A comparison of the tables shows that the average loss in strength of hand-grip in the pen writing test was 2.88 kilograms while in the blackboard writing it was only 1.95 kilograms. In other words, the average fatigue from pen writing, for this group of children, was nearly fifty per cent more than from the blackboard writing.

INFERENCES FROM THE WHOLE SERIES OF EXPERIMENTS

I. **Attention.**—The first inference is that concentrated attention is the fundamental factor in the development of motor control. This is based upon several observations:

First, that without exception, in the practice exercises, the subjects who did the work with close and continuous attention to the thing in hand made most rapid progress in setting up new coordinations.

Second, this was most marked in those who manifestly had well established habits of attention.

Third, in cases where attention seemed habitually weak and wayward there was a distinct contrast between the progress made when the work was performed in a more or less indifferent way, and that when even some transferred interest was applied to hold attention to the work in hand.

Fourth, the length of time of practice and the number of repetitions of an act are vastly less important in developing motor control than alert, concentrated attention. Indeed repetition that does not involve attention is relatively futile, so far as development is concerned.

Fifth, all of the foregoing was equally true whether the subject was well or ill developed physically. This fact is well brought out in the cases of Nos. 11 and 16 in Table III. No. 11 is weak physically, and his attention, quite alert, is of that flitting sort which rarely focuses long enough to develop interest in the object. No. 16, on the other hand, is a big robust, muscular boy, whose apparent gross strength is not shown in the tests applied in these experiments. In manual work he was distinguished for the slow, awkward, clumsy way in which he destroyed materials. In other school work it was evident that his thinking was equally slow, clumsy, uncontrolled, and inefficient. He attained a fair degree of control in such activities as playing baseball, skating, and bicycle riding, where only the coarser adjustments were required.

I am aware that this view is not in harmony with the conclusions of some other investigators. For example, Professor Bagley, who made some enquiry regarding the "Relation between Motor and Mental Ability," claims to have found at least a well marked tendency to an inverse ratio between the motor development and the class standing of a large number of children. The lack of harmony between his inference and mine may be more apparent than real. The fact that many children of good intellectual powers have not developed motor ability should not be taken as conclusive evidence that they are unable to develop it. They may not have had favorable opportunities for motor development, may even have preferred intellectual to physical activity. Besides, it must not be forgotten that "class standing" may be a very unreliable criterion of mentality. What I have called an indication rather than a conclusion, does, however, seem to be in harmony with the psychologic view of evolution. The first simple motor adjustment must have arisen in response to some conscious need of the organism and must have been brought about by a measure of active attention. This simple statement represents the history of every new adjustment. There is a more or less conscious end to be attained and *mind persistently attending,* with some sort of image to imitate, finds the way to adjust the organism to the attainment of that end with economy of effort. While this is an entirely independent and

original conclusion it is not novel. At the close of his study of "Habit and Accommodation" Professor Baldwin says:[1]

> "Attention is the go-between between copy imitated and the imitation which copies it. It is, therefore, the central and essential fact in all voluntary muscular control."

II. **Physical Vigor.**—The second essential factor in the development of motor control is a healthful, vigorous physical organism. At one stage in the progress of the enquiry it looked as though this might be considered the prime condition, but as the enquiry proceeded the mental factor took the first place. That the degree of vigorous development of nerve and muscle is an important factor in the setting up of new coordinations, and developing easy control was, perhaps, most strongly indicated by the fact that in the experiments those subjects who made most rapid progress invariably exerted great efforts in the first attempts. As has already been pointed out, in referring to the sawing exercise, when a right hand subject first tried to saw with the left hand there was usually great nervous and musclar strain extending over wide areas, one might say, over the whole body. This was distinctly more marked in the case of those who rapidly developed control. A few of the subjects, as the records show, notably

[1] J. M. Baldwin, "Mental Development," page 474.

No. 7 and No. 13, who are apparently up to the average in mentality but sub-normal physically, and No. 11, who is rather below normal in mental vigor and quite so in muscular development, only spasmodically grasped the instrument firmly. Even when the interest was apparently warm and the attention fairly concentrated and continuous they did not seem to have sufficient strength to make a vigorous effort except for a second or two at a time. When, as occasionally happened, a boy who usually worked with steady vigor, with the boy's disposition to experiment on his own account, tried to see how lightly he could hold the sawhandle, there was a marked depreciation in the control of the instrument and consequently in the character of his work. Nor ought the fact here pointed out to occasion surprise, when we recall the generally accepted theory of how new motor coordinations are started.

Professor Baldwin in his "Mental Development, Methods and Processes," has reviewed earlier theories, and upon them, with much original material, constructed one of his own. The treatment is so elaborate that it is impossible to summarize it briefly, but a few quotations will serve to suggest his point of view. Discussing simple organic adaptation, he says:

> "A new stimulus can be accommodated to only within the limits inside of which the organ can prepare itself, on the basis of former processes, to bring

about such a reaction as will tend to retain this kind of stimulus for itself. This is accomplished, in the whole range of motor accommodations from the protozoa which swarm to the light to the most difficult feat of the acrobat, by what I may generalize under the phrase 'law of excess;' it is an application within the organism of the principle upon which the natural selection of particular organisms is secured—the principle commonly known as 'overproduction.' But, generally, the law of 'excess' may be stated somewhat as follows: the accommodation of an organism to a new stimulation is secured, apart from happy accidents, by the continued or repeated action of the stimulation, and this repetition is secured, not by the selection beforehand of this stimulation, nor by its fortuitous occurrence, alone, but by the proximate reinstatement of it by a discharge of the energies of the organism, concentrated as far as may be for the excessive stimulation of the organs most nearly fitted by former habit to get this stimulation again." Page 179.

Then, referring to the conditions of development that have become more complex, he says:

"All the phenomena of consolidation or 'downward growth,' on the other hand, illustrate what is known as the law of 'Habit;' all the phenomena of specialization, or 'upward growth,' illustrate the law of Accommodation.

"As for Habit: Physiologically, habit means readiness for function, produced by previous exercise of the function. Anatomically, it means the arrangement of elements more suitably for a function, in consequence of former modifications of arrangement through that function. Psychologically, it means loss of oversight, diffusion of attention, subsiding consciousness.

"As for Accommodation: Physiologically and anatomically, it means the breaking of a habit, the widening of the organic for the reception or accommodation of new conditions. Psychologically, it means reviving consciousness, concentration of attention, voluntary control—the mental state which has its most general expression in what we know as Interest. In habit and interest we find the psychological poles corresponding to the lowest and the highest in the activities of the nervous system." Page 292.

Again, in the Chapter on Voluntary Attention, he writes:

"In persistent imitation the first reaction is not repeated. Hence we must suppose the development of a function of coordination by which two regions excited respectively by the original suggestion and the reaction first made, coalesce in a common, more voluminous and intense stimulation of the motor

centre. A movement is thus produced which, by reason of its greater mass and diffusion, includes more of the elements of the movement seen and copied. This is again reported by eye or ear, giving a new excitement, which is again coordinated with the original stimulation and with the after-effects of the earlier imitations. The result is yet another motor stimulation or effort, of still greater mass and diffusion, which includes yet more elements of the 'copy.' And so on, until simply by its increased mass, including the motor excitement of attention itself—by the greater range and variety of motor elements thus enervated—in short, by the excess discharge, the 'copy' is completely reproduced. The effort thus succeeds.

"This, it is evident, is just the principle of 'excess,' and it is very easy to find in it the origin of the attention. The attention is the mental function corresponding to the habitual motor coordination of the processes of heightened or 'excess' discharge. The exact elements which it includes have already been pointed out, and they will be spoken of again.

"Let the child once withdraw attention from his copy, let him be distracted by bird or beast, and woe to his chance of learning the new movement. The whole conglomerate conscious content falls to pieces and he goes back to be a creature of suggestion.

> But let him keep on attending—strongly, faithfully, well—and note his actions. His whole physical personality gets concentrated in conjoint, then allied, then unified, then convulsive discharge upon the member which, by habit or previous use, is nearest to the copy requirement. He rolls his tongue, bites his lip, sways his body, works his legs, winks his eyes, etc., until every scheming nerve and tendon bends to do the task. His blood vessels, even, fill toward the hand he works with. This occurs only in attention, and this is the excess wave by which here in the highest consciousness, as there in the lowest organism, accommodation to new stimulations is secured." Page 453.

While this last was written with special reference to the development of attention, and it is a satisfaction to find my own inferences in harmony therewith, it is equally clear and strong in reference to the physical factors. Note, "every scheming nerve and tendon bends to do the task." If the nervous organization be not vigorous, or if the muscular system be not well developed, how can they "do the task" that makes such demands upon them? How can the new coordination be set up, the increased control be acquired?

III. **Strenuous Effort.**—From the above it follows that vigorous, energetic effort is essential in the early stages of the process of acquiring a new accommodation,

and that the oft repeated admonition of the instructor to the young child struggling to acquire some new form of motor control, to "hold the pen easily," to "let the saw run lightly," to do the thing easily and not make such hard work of it, is wrong. The strenuous effort which the child makes is the short, direct line to the development of motor control. To insist upon a light grasp of the instrument is simply to retard progress in setting up the coordination. But, it will be urged, if the child be allowed to work with much tension he contracts a habit of working in that way, and all his subsequent exercise of that particular activity will be unnecessarily cramped and labored. This idea has long been applied to training in writing with pen or pencil. The experiments indicate its limitations.

Moreover, these results suggest another problem. Is there not danger in making the demand for a certain detailed and complex adaptation before the child is ready for it, in that the excessive energy must be kept up much longer than would be necessary at a later stage? In the experiments it was observed that in almost all cases the tension subsided as control developed, but that this relation was less marked among the younger and relatively less mature children. The significance of this observation was reinforced by another, viz.: that the tension increased with fatigue, and the testimony of many adults regarding their own writing confirms this observation. One little boy, No. 24, who appeared quite below normal

in motor control, after writing for a very short time upon the blackboard, abandoned the free arm method, rested his hand against the blackboard, gripped the handle so as to send the fluid to the top of the tube, wrote a few letters and stopped from apparent lack of power to go on. The failure was partly due to the strangeness of the instrument with which he worked, because, in subsequent trials he maintained the free arm writing with fair success. The point is: Motor development proceeds gradually from large, simple movements, to those that are finer and more complex. There is progressive preparation for increasingly complex activities. To prematurely force a complex accommodation must interfere with the normal progress of development. This is important in its bearing upon training in handwriting: To require young children to write small letters with a fine pen or pencil is utterly wrong.

IV. **Value of Regularity in Practice.**—While it has been pointed out that in the progress of the development of motor control repetition is quite subordinate to attention, and that repetition of an act that does not require attention, or requires only a minimum of attention, is comparatively futile, it is not intended to underestimate the value of practice. The experiments were not primarily intended to show the development of the practice curve and the data is quite too meager for that purpose. All that can be said is that

the experiments seem to indicate that regularity and frequency of practice are important factors in the development of motor control. This was especially noticeable in the first series of sawing exercises, in which No. 4 practiced at long irregular intervals, and, apparently for no other reason, made but little progress in either accuracy or rapidity. Some of the other cases tend to confirm this indication. In the investigation there were some cases of desultory practice by children who attended irregularly. The results were too incomplete to include in the tables, and their only value was in the support they gave on the negative side to the importance of regularity and frequency in practice.

V. **Development in Large Nerves and Muscles First.**—Another point of some general significance is the apparent confirmation of the principle often alluded to by writers on development, and worked out with especial care by Burk,[1] viz.: that development proceeds from fundamental to accessory in the nervous and muscular systems. One of the first observations made in the introspections of the subjects taking the sawing exercises with the left hand was that the fatigue was chiefly felt in the fingers. Even after a high degree of skill had been attained, it was commonly reported that the only remaining disability was the tendency to grip the instrument with the fingers, and a consequent fatigue in those members.

[1] Frederick Burk, Pedagogical Seminary, Vol. VI., pp. 5-64.

This was further supported by the experiments in writing. A study of the tables shows that in general there is less nervous and muscular tension in blackboard writing than in ordinary writing on paper. These two methods, however, involve so many differences that the physiological results are scarcely comparable. More significance may be attached to the results from the three different modes of writing upon paper. The third method in which the action involved the free arm shows the lowest degree of tension, while in the first mode involving mainly finger action, the tension is highest. Moreover, the blackboard writing was generally smoother and more regular than that on paper, even than that written on paper with the whole arm movement, because the blackboard writing was done with more ample movement. In the free arm writing on paper there was an obvious effort to keep the size of the letters down nearly to the usual size of pen or pencil writing and this necessitated a restrained, partially inhibited movement of the arm. The easiest movements were the freest arm movements, the most difficult were the most restricted finger movements. This must be understood to apply to the progress of the development of control. When, at the proper time control of the fingers has been attained for appropriate activities the work involved may doubtless be done by the fingers with less effort than if the whole arm

were brought into play. It must be a waste to exercise large areas when small areas can easily perform the function. The teacher of writing who insists upon exclusive arm movement is as unreasonable as those who allow exclusive finger movement.

VI. **Value of Broad-pointed Instrument.**—Directly connected with the above is another point. It was found that writing with a broad, smooth pen was, for most of the subjects, easier than writing with a fine pointed pen, and similarly, that writing with a broad, soft pencil was easier than with a hard, finely pointed pencil. With the finer instrument the children seemed instinctively to feel that more care must be exercised, that finer adjustments were necessary.

VII. **How Tension is Relaxed.**—Incidentally it was shown that in writing exercises there was a release of tension whenever the instrument left the writing surface, that is to say, when the pen, pencil, or crayon was momentarily raised in passing from one word to the next or between letters—where the connecting line was omitted. This will account for the common tendency among young children learning to write, among persons feeble with age, and among all of us when sensibly fatigued, to omit non-essential upstrokes and inconvenient joining lines between letters in script. The skips between letters come

to form a sort of rhythmical relaxation of tension and thus greatly reduce the fatigue of continuous activity.

VIII. Interest.—The thoughtful reader will wonder why interest has not been given prominence among the factors in the development of motor control. There are three reasons for this. *First,* interest is really included in attention. It is the emotional element in attention. We give attention to a matter because we are interested, we wish to attain some desired end. As the attentive process continues new ends and aims, new elements of interest may arise to hold attention upon the problem. We attend to a matter only while we are interested. *Second,* in the experiments upon which these inferences are based there was little direct interest. The sawing and writing were done, not to produce something of direct value to the subject, but because I wished it done. It was observed, however, that in those cases, where the subject was, for personal or professional reasons, most interested in the outcome, success was distinctly most marked. *Third,* next to the beginning of a discussion, the place of emphasis is at the close. Without detracting from the emphasis upon attention as the first and greatest factor in developing motor control, I wish here to impress the importance of interest. Where possible, direct interests should be utilized, otherwise recourse should be had to indirect interest, relying upon the development of direct interest through attention.

General Summary.—Whatever general significance there may be in this brief study of these various subjects actually engaged in manual occupations, under conditions as nearly normal as experimental exercises can be made, may be stated in a few words. It has always been claimed for manual training that one of its chief benefits is along this line of developing motor control. That seemed a quite obvious result. The study confirms this view. The simplest manual occupations, exercised with a fair degree of regularity and frequency, under the influence of interest and attention tends to develop, more or less rapidly, voluntary motor control for the particular movements involved. The race has evolved its powers through contact with its environment. In the later stages of the evolution that contact has been very largely a manual one. But all voluntary motor activities involve attention. Nothing worth while can be accomplished without attention. Moreover, as Professor Baldwin has somewhere said, if attention is not itself a motor phenomenon, it stimulates and correlates motor aspects of all to which we attend. In other words, manual occupations represent the working of the philogenetic law by which the psycho-physical powers have been evolved, and hence by which it is reasonable to expect the process to continue to go on.

For fuller studies in motor control see, Bryan, American Journal of Psychology, Vol. V., p. 123, and Book, University of Montana, Bulletin 53.

CHAPTER VII

Physical and Physiological Results.

Education of the Nervous System.—In every stage of this enquiry the student should bear in mind how very slowly new general conceptions of important phases of the life of human society develop in the minds of the people. For generations there have been those who, in discussing education, have emphasized the necessity of due attention to the physical nature of the child, combating the more prevalent notion that it is the function of the school to give only mental training, or at most, mental and moral training. The time honored platitude, "it is the mind that makes the man," has been at least misleading, because only a half truth. Studies in physiological psychology are throwing light on this important subject. It has been made clear that in a very large measure the brain, indeed the entire nervous system, is at once the creature and the servant of the organism as a whole. Nervous tissue is only a specialized form of protoplasm evolved by the organism to perform special functions in its organic economy. In a very large and important sense education has come to mean the development of the nervous system, but on the physical side it has come to mean

more than that. The recognized intimate relations among the sensory, the central, and the motor systems, and their mutual interdependence, make it obvious that education is primarily neuro-muscular development.

Anatomy.—In order to understand how manual activities affect this development it is necessary first to review some features of the neuro-muscular equipment and to consider the possibilities of growth and development during childhood and youth. Considered anatomically the nervous system is composed of an aggregation of nerve elements embedded in a matrix of structures which support and nourish them.

Chief Divisions.—There are two grand divisions: the central system, including the brain, spinal cord and spinal ganglia; and the peripheral system, embracing all the trunks and branches which connect the central system with the rest of the body. This peripheral system is more properly two systems, an afferent or sensory system composed of special sense organs and the fibers which connect these with the central system, and an efferent or motor system connecting the central system with the muscles in every part of the body. Formerly the terms employed to designate the nerve elements were "nerve cell" and "nerve fiber," and it seemed to be implied, and was generally understood, that these two kinds of elements were in a way distinct

in both origin and function; that the cells were sort of organic batteries and the fibers were wires connecting them. According to later investigations the fibers are merely outgrowths from the cell body, and this cell body together with all its fibrous growths constitutes the nerve cell. That there are estimated to be about 11,000 millions of these cells in the human system indicates what an army of trained, harmoniously co-operating workers the educated person may have.

Dendrons and Neurons.—Of the cell outgrowths there are two kinds, dendrons and neurons. The dendrons are so called because they branch out into the surrounding tissue in a tree-like manner, while the neurons have a uniform caliber and the branches arise at right angles, usually only at the distal end. A cell may have several dendrons, but usually only one, sometimes two, and very rarely more than two, neurons.

Both the dendrons and the neurons are pathways for nervous impulses, it being generally assumed that the dendrons convey impulses to the cell body and the neurons carry them away from it. It is not certain, however, that a given branch may not contain two pathways, one afferent and the other efferent.

Nerve Development.—According to Professor Donaldson, a study of a section of the developing spinal cord shows germinal cells dividing and producing

young nerve cells, called neuro-blasts, having a large nucleus and a mass of cytoplasm at one pole, while this cytoplasm is being gradually drawn into a slender thread, the beginning of a neuron. As the neuro-blast grows there are marked changes in the developing cell; first, a great increase in the amount of cytoplasm, and second, an enlargement and elongation of the neuron.

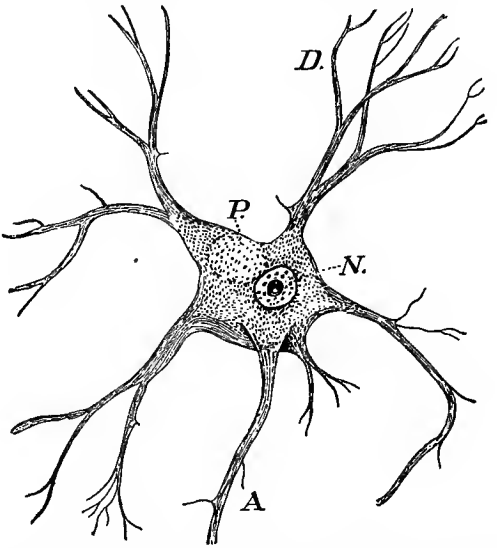


FIG. 4.—Isolated body of a large cell from the ventral horn of the spinal cord. Human, × 200 diameters. (Obersteiner.) *A*, neuron; *D*, dendrons; *N*, nucleus with enclosures; *P*, pigment spot.

In the central system these prolongations extend from the cortex of the cerebrum to the lumbar en-

largements of the cord, and in the peripheral system they reach from their point of origin in the cord to the most distant portions of the extremities. In each instance the fiber is a continuous growth of the cell body. Thus the outgrowths may become quantitatively the more important portion of the cell, sometimes equal

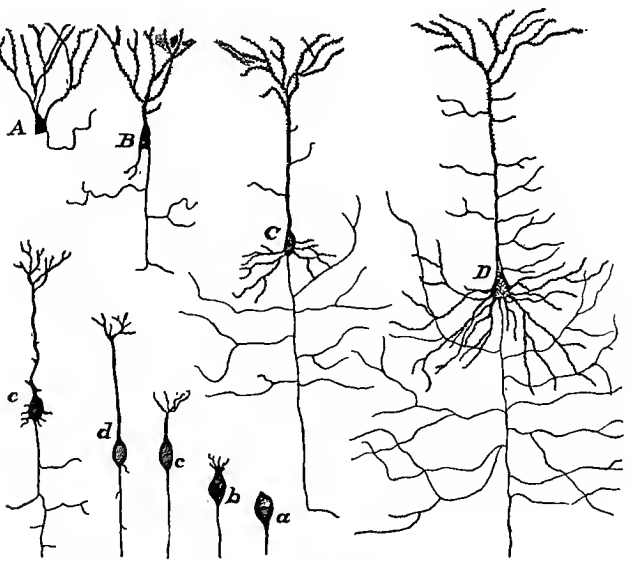


FIG. 5.—*A-D*, showing the phylogenetic development of mature nerve cells in a series of vertebrates; *a-e*, the ontogenetic devolepment of growing cells in a typical mammal. In both cases only pyramidal cells from the cerebrum are shown. *A*, frog; *B*, lizard; *C*, rat; *D*, man; *a*, neuroblast without dendrons; *b*, commencing dendrons; *c*, dendrons further developed; *d*, first appearance of collateral branches; *e*, further development of collaterals and dendrons. From S. Ramón y Cajal.)

in volume to 500 times the cell body, and sometimes are even less than the cell body. Further, it seems that generally small cell bodies have neurons of small diameter and large cell bodies have neurons of large diameter.

It is believed that the generation of new nerve cells ceases with the third month of foetal life, but after this time the total volume of the whole nervous system increases about 47 times. Since it is known that some parts of the system increases 10,000 times the original volume, it is evident that some parts increase little or not at all. Donaldson says: "The constructive development of nerve elements consists in an increase in size, in the formation of abundant cytoplasm and outgrowths, and in chemical modifications which affect differently the several subdivisions of the cell." [1]

The studies of Kaiser upon this point are interesting. He examined and estimated the number of developed nerve cells in similar portions of the spinal cord of man at different ages and tabulated the result as follows:

Age.	Number of Developed Nerve Cells.
Foetus, 16 weeks	50,500
New born child	104,270
Boy, 15 years	211,800
Male adult	221,200

Table VI, showing the number of developed cells in the cervical enlargement of man at different ages:

[1] Donaldson, "Growth of the Brain," page 343.

Development During Childhood.—It must be remembered that this does not refer to the number of cells, but only to those that are developed so as to function as part of the system. It will thus be seen that the growth of the system goes on very rapidly between birth and the sixteenth year, but that it does not necessarily cease then. On the contrary it is believed that development may be kept going, at least in the cortex, up to the thirtieth, fortieth, or even fiftieth year.

Further evidence of this growth is found in the fact that the average weight of the brain of a male child at birth is 372 grammes; that of an adult male is 1,360 grammes, an increase of 265 per cent.

How the Nervous System Grows.—This possible increase in the total weight of the nervous system involves three factors:

1. Increase in the mass of some of the previously undeveloped cell-bodies.

2. Increase in the number and size of cell outgrowths.

3. Acquisition by the outgrowths of a medullary sheath, a process technically known as myelinization. This last named factor is probably the chief source of increase in weight, and its educational significance will appear later.

Recapitulation.—Restated, the condition of the

nervous system at birth is probably this: Every nerve cell which will be found in the adult is already present and all the main fibers and trunk outgrowths are formed, but a large number of cell bodies are *undeveloped* and the fibers are not generally insulated from surrounding tissues, are not organized into systems of associated, co-operating groups. An impulse received in one part of the system spills as it goes along, overflows the whole system. There is always an *excess discharge* of nervous energy and a corresponding general excess response of muscular activity. In the very young child this condition is doubtless most favorable to the healthful development of the whole organism. A slight local stimulus gives rise to some general activity over large areas of the neuro-muscular system. Hence, exercise, circulation, nutrition, and such conditions of growth and development are general and not localized or special. When, however, controlled and specialized activity becomes desirable, this spilling of the impulse throughout the system would be most wasteful and render efficiency impossible.

A Two-fold Problem.—Now, if we are to be guided by the pedagogic doctrine of recent physiological psychology that education is the development of the nervous system, that there is a psycho-physical parallelism in all activity, that is, for every change in mental state there is a corresponding change in phys-

ical state, two questions arise: First, the general question,—What are the conditions favorable to the growth and development of the nervous system after birth? Second, the more specific one,—How do manual activities affect these conditions?

To treat the former in detail would require a volume by itself, but the general answer is plain and simple. The first condition is that the nervous system shall be properly nourished; that there shall be in the nourishing structures about the whole system a free circulation of blood supplying abundantly the proper nutritive elements and carrying away waste. The second condition is that there shall be exercise of the nerves appropriate in kind and amount. The nervous system is an extremely delicate organization which must function in order to grow, but unsuitable stimuli, or too much or too little exercise, may be equally harmful.

To the second question the answer is not so obvious though, in general, it will readily appear that any form of appropriate physical activity promotes circulation, digestion, and assimilation, and hence. tends to keep the whole organism in a healthful condition. It will also be conceded that the physical activity is even more important to the growing child than to the mature adult. But this is a very superficial view; we must look deeper.

Probable Limits of Growth.—While it is not claimed that any process of education can produce essentially fundamental changes in the nervous organization, it is believed that certain kinds of experience, certain modes of training can stimulate into functioning activity some of the dormant, undeveloped cells, and to some extent can, through suitable exercise, strengthen the already formed structures. In a child whose developed nerve cells are relatively few and ill-nourished such training will have little result, but it will be correspondingly effective in growth and development, where the nervous organization is vigorous and predisposed to activity. Racial inheritance or family characteristics may largely determine the possibilities of continued growth. In the case of individuals or races where life experiences early become a settled routine a limited number of associated activities become habitual. The simple conditions of life do not demand many new experiences and there is little inherent impulse to seek them; hence, certain habitual reactions become early established and later growth is improbable, if not impossible.

Donaldson says: "It is to be anticipated that one great difference in races will be found to lie in the extent of growth and organization in the nervous system after birth, and especially after puberty. Should it turn out on further examination that some of the

lower races lose their capacity for training after adolescence, we should look with interest for changes in the central cortex in order to determine whether growth there practically ceases at puberty. [1]

It is now well established that among some of the lower races, and in some individual cases in other races, the capability of intellectual education practically ceases at about the age of puberty, and there are evidences that in all such cases the one hope of further education lies along the line of direct appeal to the sensori-motor portions of the nervous system; that is, practically, in large measure, to manual activities.

Conclusion.—Without trying to cover the whole field of this topic the following general conclusions may be indicated:

1. The nerve cell is itself a source of energy. In early life at least, both the cell body and the outgrowths are plastic and capable of growth and development. An important factor in promoting this growth is the necessity of adjustment to new conditions, the establishment of ready means of communication and co-operation among different cells and groups of cells. In a certain sense the whole cortex is motor; when stimulated at any point there is a response in some form of muscular activity. Every effort of the

[1] Donaldson, "Growth of the Brain," page 349.

organism to perform a new act tends to develop previously undeveloped cells into activity and to establish new lines of association and co-operation. By repetition of these experiences new outgrowths are produced and some of these already present are enlarged through exercise and the development of the sheath. For a time every repetition of a new activity continues to promote this growth. When one estimates the almost infinite number of sensory discriminations and muscular activites that are involved in a simple act of manual manipulation such as modeling a rabbit in clay, taking a running stitch, or making a mortise and tenon, and how all the cooperating nerves and muscles must act in perfect harmony in time and in degree of energy, he can get some notion of the effect of such activities upon the growth and education of the neuro-muscular system. Accepting the view that the race has in all the earlier stages developed largely through its efforts in manual manipulations it is evident that this is "the good old method of education," and that, within certain limitations, the more varied and the more complex the activities essayed the greater the number of neuro-muscular elements developed and the larger the number of co-operating areas established.

Reference has already been made to the strength of the impulse to motor activity and to the interest in

various forms of manual arts, as well as to the physiological effect of the emotional attitude of the worker during the performance of any activity. It is reasonable to infer, therefore, that when a child is engaged in manual occupations that he enjoys, the emotional factor of the activity, as well as the natural intensity with which it is performed, are most favorable to a healthful development of the system.

2. It has been pointed out that the manual arts furnish some of the best means of developing the powers of sense discrimination. Not only, therefore, does this normal method of sense training assist materially in the general devlopment of the nervous system, but a well developed sensory system makes the individual alert and receptive, just as a well developed efferent system gives promptness and effectiveness in execution, and a central system well developed and organized in connection with the other two gives poise, control, and practical judgment.

CHAPTER VIII.

Intellectual Values

In the preceding chapter it was shown that motor activity is essential to the differentiation and development of the nervous system. Our topic requires that we go somewhat more into detail and show that it is largely through some kind of physical movement that the young child gets its first real knowledge, first becomes aware of himself and of things other than self. That which is so important in the beginning continues to be of great significance throughout life, and especially during the distinctly developmental stages of childhood and youth.

Three Kinds of Motor Activity.—Various motor activities may be grouped in three classes; *first,* pure reflex activities such as breathing, winking, sucking, and grasping; *second,* random movements, due to accumulated nervous energy which seeks its own discharge, but have no other stimulus and no aim or purpose, such as the restless arm and leg movements of a little child; *third,* voluntary movements made in response to some special stimulus and directed toward some end. Examples of this are too numerous and obvious to need mention.

Development of Voluntary Movement.—It is with this third kind of motor activities we have chiefly to do, but it should be understood that movements of this kind

have their origin in the other two kinds. It will be easy to see that random movements give results in sensation that lead the organism to perform some other movement involving more or less of consciousness, aim, and will. If the result of the random movement is an agreeable sensation, there will be an effort to repeat that movement again and again in order to reproduce the sensation. Similarly, if the random movement results in an unpleasant sensation there will be a movement to avoid that sensation. These first efforts to control movements are likely to be very clumsy, and to involve a large excess nervous discharge spreading over the whole nervous and muscular systems. But, through some line of this discharge of nervous impulse success is attained. In each subsequent success there is a little less waste of effort. In this way certain cell bodies and outgrowths become the special pathway for the stimulus that produces that particular movement. In time the outgrowths become enclosed in a sheath, an insulation, and the nervous energy, with the consequent muscular energy, is still further economized. Thus is set up a system of specialization in function among nerve elements. This differentiation and specialization of function is the beginning of consciousness and hence the beginning of intellectual power. Throughout life mental development depends upon this kind of growth and organization.

Sense-Training.—The importance of training the senses has already been sufficiently elaborated in Chapter IV, and the relation of training in manual arts and industries to sense-training has been shown. It is, therefore, scarcely necessary to suggest a recalling of how, in dealing with materials in the kitchen, the sewing room, the shop, the art room, and the garden, these sense powers are constantly being trained under most favorable conditions.

Manual Activities and Right Attitudes.—In the chapters on *Development of Motor Control* it was pointed out that a fundamental factor in such development is the emotional attitude toward the activities involved. When we consider this in connection with another fact, that children almost invariably enjoy handling material things, planning and designing, constructing and producing something of value, in other words, enjoy the activities themselves and the sense of power that comes through work in manual and domestic arts, we see how favorable these experiences are to the development of the intellectual powers involved.

Training Attention.—Psychologists and other teachers are agreed that the most important work in intellectual education is the development of the power of prolonged, concentrated attention. The ability to apprehend facts, to comprehend all the conditions that pertain to a particular situation, to compare and see relations, hence

to exercise good judgment, all depends upon this power of attention. We know also, that attention is conditioned by interest, in other words, by the motive. We attend to that in which we are interested, that which we have some motive for considering. All our voluntary activities are directed toward some end, the attainment of something we consider of value. It is a pathetic truism that a considerable percentage of our children become indifferent, idle, troublesome, and eventually leave school because so much of the work provided does not appeal to them as of value. They have no genuine motive for doing it. In Chapter III it was shown that children have many interests in the various forms of manual activities. This psychologic theory has been confirmed by experience. Among the most obvious results of the introduction of manual arts and domestic science into the schools is the fact that many more pupils continue in a school a much longer time than before these lines of work were introduced.

This should require no argument. Many children have no direct interest in much of the work assigned in school. The skillful teacher finds a way of supplying an indirect interest, and if this works well a direct interest may develop. But practically all children have a direct interest in well-planned work in manual arts and industries. When a boy elects to make himself a sled, or a girl an apron, there is a genuine motive for every

step in the process. The end is seen more or less clearly from the beginning. Each step is planned and executed with reference to the whole. Nothing can be done right without due attention. If mistakes are made they must be corrected. The more complex the project, and the more the worker is left to his own initiative and self-direction, the more attention he must give to it, hence, the more training he gets. It follows, then, that under right methods of training (see Chapter XVI) work in the shop, the kitchen, the garden, etc., provides most favorable conditions for developing the power and the habit of attention.

Constructive Imagination.—Among the powers exercised in giving attention to work in manual arts and industries is constructive imagination. Where the teacher is wise enough to let the pupils make their own plans, at least tentatively, the project must first be built up in imagination. There must be images of the whole, of the parts individually, and of these assembled in the whole. This is just as true of dressing a doll as of making a table. The girl who cannot use this power in dressing a doll appropriately, certainly should not be expected to select suitable clothing for herself. Moreover, unless she has had considerable experience in thus planning or designing things, she could not be qualified to select furniture or wall-paper for a room, to hang pictures, or even set a table so that it would look well. To the boy in most walks in

life this training is equally important. Whenever he has to do with the construction of anything, or to judge of the value of anything constructed, this constructive imagery comes into play. Moreover, this power is essential in understanding descriptive literature, in all problems in mensuration, and in all forms of invention, or of artistic industrial designing.

Practical Judgment.—Another very important intellectual power is judgment, and it is easy to see how practical judgment is continually being exercised in work in industrial arts. First, there are the questions, What do I want to do most? What is most worth doing? How long will it take? Then there is the determination of plans, general and particular; the deciding upon materials; the order of steps in the process. As the work proceeds there is an exercise of judgment at each and every stage as to whether results are satisfactory. When a boy has finished a project he rarely needs to be told whether his work is good, bad, or indifferent. A girl who has had intelligent experience in sewing is likely to be a much better judge of fabrics than one who has had none, and one who has had good training in cooking not only knows how foods should be cooked, when they are well cooked, but what foods are wholesome, nutritious, and economical. When she reads a new recipe her judgment tells her whether it is worth trying or not. In dealing with ma-

terial things it is especially true that one learns quite as much by his errors in judgment as by his successes.

Reasoning.—Professor Angell has given us a broad definition of *reasoning* as *"purposive thinking*, that is to say, thinking carried on in the interests of some plan which we wish to execute, some problem which we wish to solve, some difficulty which we wish to surmount." Now, it is in manual arts and industries precisely these conditions that make them intellectually educative. There must be a more or less clearly defined end in view in each piece of work undertaken. The process must involve thinking out a plan, and in the execution there will be difficulties to surmount. The "uneducated" cook cannot understand why "there are days when the bread won't raise;" the unskilled dairy maid is helpless before the fact that one day it takes only fifteen minutes' churning to produce good buttter, while another day she works an hour and gets an inferior product. The person who has been put into the right attitude toward such things knows there is no chance about them; they are governed by simple physical laws. When things do not go right it is the business of the worker to search out the cause, to find a way to remove it, and so set the process going as it should. Thus we find that in these so-called manual occupations we have training, under favorable conditions, in every kind of intellectual activity, perception, memory, imagination, conception, judgment,

reason. In fact, where there is reasoning there must be all the other processes, because reasoning, the most complete process, involves all the others.

Motor Training for Defectives.—The now generally accepted theory in regard to the education of feeble-minded children, and indeed the prevailing practice in the best schools for such children, are strong confirmation of our contention that systematic training in motor activities is an important means of developing intellectual activities, especially in the early stages. Sequin [1] is probably the best authority on this subject.

In his careful investigations and extensive experience he found that feeble-minded children, under training in the usual school studies, made very little progress in intellectual development. On the other hand, when he began with training in motor activities, there was usually a very perceptible awakening of mental powers, and in proportion as they gained in motor control they gained in mental alertness and in power of sustained attention.

For the testimony of an expert neurologist on this point one should read Donaldson, "Growth of the Brain," especially Chapter XVIII. The gist of his view is that formal education should aim first at the development of the motor areas, because they naturally function first,

[1] Sequin. "Idiocy and its Treatment by the Physiological Method."

and the development of the higher centers depends upon that of the lower.

Cautions.—Again a word of caution seems necessary. There is nothing in this discussion to imply that handwork may not be done with little or no attention or thought. Some forms of occupation soon become so nearly automatic as to require but little attention, but these should not be the things that occupy much time or attention in a school course. Then too, the "uneducated" teacher of manual training or domestic science may impoverish the course by prescribing "cut and dried" directions, and removing much of the necessity for thinking. Furthermore, this may be the best place to say, that, while well directed work in such academic studies as literature, science, and mathematics, gives excellent intellectual training, such work may be done in a way that requires very little mental effort, and mere reading may become a favorite resort of the intellectually lazy.

CHAPTER IX.

Aesthetic Values.

Meaning of Aesthetic Activity.—Grosse has given us a good working conception of artistic activity:

> "By an aesthetic or artistic activity we mean one which in its course, or in its direct result, possesses an immediate emotional factor—in art it is usually a pleasurable one. Aesthetic activity is, therefore, not entered upon as a means toward an end outside itself, but is in itself the end. In this respect it presents itself to us as the exact opposite of practical activity which always serves as a means." [1]

Further Description.—Three other ideas are essential to a right understanding of this activity. *First,* it is rarely an isolated activity, but very commonly combines with practical activities of one kind or another. This is very important in this connection because in the main we are dealing with distinctly utilitarian occupations. *Second,* the pleasure which characterizes an artistic activity may be realized throughout the whole course of the process, or in its result, or in both. *Third,* the enjoyment is not limited to those who perform the activities or produce the results, but is shared by those who through any sense are able to partake of its pleasure-giving power.

[1] Ernst Grosse. "The Beginnings of Art," page 48.

This condition is essential to the fullest realization of the effect by the artist himself. His work must have some measure of public approval. The following is a clear statement of this view:

> "In order to define art exactly, we must first of all cease to look upon it as a means of gratification, and consider art as one of the conditions of human life. Considering art in this way, we cannot but see that art is one of the means of communication of people with one another.
>
> "Every production of art brings it to pass that the recipient enters into a certain kind of relation with the person who produces or produced that object of art and all of those who, at the same time with him, before, or after him, receive or will receive the same artistic impression.
>
> "As speech, which conveys peoples' thoughts and experiences, serves as a means of uniting peoples, so art acts in exactly the same way. The characteristic of this kind of communication, distinguishing it from communication by means of words, consists in this, that by words one person conveys to another his thoughts, while by art people convey to one another their feelings." [1]

Early Evidences of Art Impulse.—The earliest manifestations of the aesthetic impulse take the form of play.

[1] Tolstoi. "What is Art," page 70.

The child plays with its vocal organs, mere cooings and babblings to be sure, but taking somewhat a rhythmical movement, and gradually growing into a crude sort of song. Then follow various forms of personification, dramatization, and personal decoration, all involving, beside art, a large measure of the impulse to imitate.

It has been suggested in Chapter III how these impulses to play and to imitate are but the natural precursors of the impulse to construct, and how this, in turn, gives the occasion for the normal expression of the impulse to produce artistic design in plan and the attempt to decorate the constructed article.

Origin of Art.—A study of the art of primitive peoples shows us that one form of art invariably begins with an attempt to decorate an article that has been constructed for some practical purpose. This seems to be a natural sequence. When one gets control of a practical activity the aesthetic impulse seeks its opportunity, its medium, for expression as an accompaniment of the practical. The utilitarian product expresses the purpose of the worker; the decorative element expresses the emotional attitude. This feeling may be pride in the result of the labor, or in ownership of the product, of a sense of joy in contemplation of what seems beautiful in decoration itself.

Examples of Art Evolution.—The primitive modes of cooking were purely utlitarian, to make the foods more nutritious and more digestible than in the raw state. Now

the cook or housewife, who takes any sort of pride in her cooking, studies numberless ways of making her dishes attractive to the eye as well as to the palate. Even plain ham and eggs are served on a dish garnished with a spray of parsley. Table porcelain presents an exceedingly interesting aesthetic evolution, of which, however, the vast majority of people know little or nothing.

The first pottery was made solely to be used as containing vessels. The material used, the general form and the character of the surface, offered such opportunity for the expression of aesthetic feeling that for a long time nearly all pottery has been more or less decorated. A later stage of the evolution of this industry has given us immense quantities of pottery from which the utilitarian motive has disappeared entirely. It is produced solely for its aesthetic value, and takes its place among the fine arts.

Examples of Application.—The young child of to-day has many marked advantages over the adult of primitive times in possible ideals of construction and decoration. His environment is full of suggestion for him, so that, as compared with race progress, he can make short cuts to results in both.

A Rug.—A little girl who designs the pattern and selects the colors for a rug for her doll's house has essentially the problem of the primitive weaver, but may have also much aid from the products of modern textile art. At the same time the number of

colors and the complexity of design in the rugs the child observes may be a hindrance, unless there is wise guidance on the part of the teacher. An early form of floor covering was simply woven rushes. If the child merely wishes to cover the floor, a piece of coarse canvas, or a rug of plain gray wool would suffice; but, just to the extent that she tries to secure pleasing effects by choice of colors and by arrangement of these in design, she expresses her aesthetic impulse and develops her taste.

A Waist.—When the older girl in the sewing class comes to choose the material, decides upon the pattern, and selects the trimming for a waist, she becomes an amateur Worth. There will be an exercise of practical judgment and of aesthetic taste in deciding upon the appropriateness of the material for the purpose for which the waist is intended. In deciding upon the color there will still be an exercise of practical judgment as to what is appropriate for the occasions when this waist will be worn, but artistic feeling will predominate when relating the color of the waist to that of the other clothing to be worn with it, to that of her own complexion, eyes, and hair.

A Piece of Furniture.—Similarly, when a boy in the shop plans to make a chair, a table, or a book-case, he should be encouraged to determine for himself upon the size of the whole, then upon the relative proportions of

the whole, and of the various parts; first, with a view to its utility, and second, to its appearance. The selection of the material may be largely an intellectual problem, but even this will have its aesthetic factor. Pine is admirable for some purposes, but no kind of stain or finish can make it appropriate in fine furniture. Then, if the young worker can be led to see that good proportions, plain, simple lines of construction well worked out, give a vastly more pleasing effect than an attempt at elaborate ornament out of harmony with the purpose of the article, or indifferently executed, he has made a good beginning toward the development of an artistic conception of constructive work.

A Question of Methods.—The extent to which the children shall be left to themselves in these matters is a problem for the teacher. It should never be forgotten that the dominant purpose, nay rather the whole purpose, is the development of the child and that *development can come only through his reconstruction of his own experience.* Where the teacher provides completed models to be reproduced, or makes plans to be followed in detail by the pupils, or where the pupils work from dictation, whether dealt out in the aggregate or in petty installments, the child gets only a modicum of experience and that in a very unacceptable, unsatisfactory form. On the other hand, when pupils are allowed a large measure of initiation and self-direction in these matters they make

mistakes, grievous mistakes, but they get the full benefit of the experience; they derive the result, learn to know the joy, of independent effort; they develop an abiding interest in the problems involved in the experience. When they realize these problems they are prepared for genuine study of the subject, whether by referring to books, by examining good examples of the thing they wish to make, or by discussion with teacher and classmates.

Personal Motives.—Drawing comes to have a new meaning and value to boys and girls when they wish to represent definitely their plans for the construction and decoration of some article. Some of the best drawing and composition the writer has ever seen produced by young children was in nature study reports in connection with the work in a school garden. Again, the study of color is vital when it becomes a question of a suitable waist for a slight blonde or for a stout brunette; or when it is a question of how to finish a bird-house or a parlor tabouret.

Taste in Color.—The natural inclination of most children is toward brightness in colors, and elaborateness in decoration. The genuine artistic problems in connection with work in manual arts present the most favorable opportunities for indicating where bright colors are appropriate, and where quiet colors and simplicity of design and of decoration in general are more effective.

The General Aim.—Let us not be misunderstood.

We do not teach literature with the idea that even one pupil in a hundred will become a producer of literature; rather that each may, in proportion to his capacity, develop a taste for the best in literature, may share in what the masters have provided for all who qualify to receive and enjoy them. True, if the teacher of English recognizes in his classes a "lad o' pairts" in a literary way, he should foster the rare talent as fully as possible, but the teacher's great work is always with the ninety and nine. These will come most fully into an appreciation of the art of literature when, having studied some of the best intensively, they try to write something that, to them, in form as well as thought, seems worth while.

In like manner, we do not teach music in the public schools with the idea that we shall develop a Handel, a Mendelssohn or a Patti. Nor do we teach drawing and painting hoping to produce a Raphael, a Rembrandt or a Rubens. If the embryo masters are in our midst, these public school courses should help to discover them, but the real work on the aesthetic side, in relation to the great productions of art, is designed to develop appreciation, that the mass of our people educated in the common schools may acquire a discriminating taste in these things, that they learn to enjoy what is most inspiring and elevating.

Scope of Application.—This principle is very far-reaching. Under the direction of judicious, well-trained

teachers, pupils may develop ideas of harmony and good effect in colors through the use of colors in adding beauty to something they value because of its usefulness. When they want a design for something they are making, they are ready to study design with a motive, that is, with genuine interest. Then the idea of design becomes incorporated into the life experiences, and is not a thing apart.

Children who have had a course in pottery, under good instruction, will never be satisfied with porcelain smeared with natural flowers, or with the crude color bespattered stuff that has been thrust upon the American market as Japanese art.

Boys and girls who have been rightly directed in the making of designs for wall and floor coverings, will have no use for those patterns that throw everything else in the room into the background. Present conditions in this respect are well expressed by a statement recently made by a designer for a large New York wall paper factory: "Nine out of ten of the designs I make are bad. Manufacturers have to make what the people will buy, and very few people in America know a good design when they see it, or will buy it when a responsible dealer assures them it is good. Indeed, few house decorators have had a training that enables them to know good designs."

Children who have been led to study house decoration under a competent teacher will not decorate (?) the

front room by hanging a crude crayon reproduction of the photograph of some loved one in a massive shell frame of gilded gypsum or putty.

The girl who has studied what is appropriate in dress will have simple house dresses in which to work, and will not be found doing the morning work or going to market in an old evening gown.

One more illustration must suffice. Those who have done even a little work on furniture will have a life long interest in the contemplation of what is good and appropriate, and will have only contempt for the machine pressed imitation of carving, cheap showy upholstering, or imitation woods.

No doubt one reason why so many boys and girls leave the farm is that they do not learn to see and appreciate the beauties of nature all about them. Better farming will develop this appreciation. No one can resist the attraction of well-bred stock. All the farm folk see the beauty of waving crops when they are good crops. From contemplation of these one comes unconsciously to see, admire, and love the green valley, the winding stream, the wooded hills. More renumerative farming will allow time and money for art, and art always leads back to nature.

CHAPTER X

Ethical Values

Specific Problem.—Attention has already been called in Chapter II to the fact that the introduction of manual arts and industries into elementary schools was first chiefly urged for ethical reasons. Moral and religious reformers took up the cause in the belief that idle habits and lack of skill in common industries are prime causes of vice and crime; that on the other hand, persons trained into habits of industry, especially skillful industry, are not only likely to be preoccupied in wholesome ways, but are also likely to be self-reliant, self-respecting, and self-sustaining. In other words, these habits, these characteristics are fundamental conditions of an ethical life, and these reformers appreciate the great fact that in the matter of habits an ounce of formation is worth a ton of reformation. This view will be generally accepted, but it must be remembered that these advocates of manual arts in the schools had in mind, in most cases at least such training as would lead directly to some mechanical trade. Our idea is not primarily that at all, but rather to provide for experiences that are important factors in the early education of every child. In what special ways have these experiences an ethical value?

Workmanship Impulse.—The disposition to work is not an original impulse or instinct. Primitive man had no daily routine of occupations such as characterize civilized life. His activities in the main, were directed toward supplying his immediate needs for food, shelter and other protection. Through countless generations individuals of the race have been engaged in those activities necessary to sustain life, satisfy desires, remove discomforts, and gradually to procure luxuries. Concurrently with these experiences the development of retentive memory and reason enabled man to see that his efforts may be economized by doing certain things at certain times, by anticipating certain needs and providing for them in advance. Gradually he learned to project himself more and more into the future, so that the plans and activities of to-day may be prompted by an end to be realized months or even years hence.

Children Live in the Present.—In young children this kind of workmanship impulse is little developed. They are, fortunately, unable to project themselves into the future, to anticipate needs; hence, they do not undertake projects with remote ends. If they build a hut or dig a cave, it is for the present, with little or no thought for next year. The real workmanship attitude, the attitude that impels the individual to undertake economic projects to provide for future needs, possibly the needs of others as well as the self, must be developed.

Doubtful Conditions.—In many children the usual school studies do this to some extent, but there are two important limitations. *First,* the activities of the pupil in his study of books are very different from his probable activities in after years. Indeed, some persons get the student habit so firmly fixed that they are unable to succeed in other things. Commonly the working habit of the student of books is only partially transferable to manual work. *Second,* there are many children who do not "take to books." To such children much of the school work does not seem worth while. Learning to spell words that they never expect to use, reading about things that they already know, or do not care to know, solving problems that are no problems of theirs, all these conditions tend to make them indifferent, train them to slight and shirk assigned work.

Favorable Conditions.—On the other hand, nearly all children like manual activities, and this is likely to be especially true of those who are not attracted by books. These activities, when well planned, furnish the natural medium for the expression of the impulses to do, to construct, to imitate, to experiment. Moreover, to most children, under favorable conditions as to training, the work in manual arts and domestic science seems more worth while than much of the assigned work in books. There is concrete material with which to work and the end is a definite reality. Incomplete preparation of a

lesson may not be easily discovered. In the case of handwork, if the child's motive is not strong enough to carry the project to completion, the failure is obvious. It is usually easy for the teacher to insist upon its completion. The result speaks for itself. Every step of the process stands revealed in the product. It is a concrete example of "Virtue is its own reward."

But, the teacher should remember that, educationally, the finished product is not the thing of value. The vital product is in the child, in the satisfaction he derives from the various stages of the work, and especially from the completed product, in the sense of power he gains, in the self-reliance developed, in the attitude toward new undertakings. These conditions are essential to the development of an ethical character.

A Sense of Responsibility.—An important element in moral character is a sense of responsibility for time, opportunity, obligations assigned or assumed. In this country, at this time, the importance of this sense of responsibility can scarcely be overestimated, because American boys and girls, especially in urban life, are deplorably lacking in this respect. The cause, in part, is the change in industrial conditions that have removed the necessity for the children's sharing in the responsibilities of the home life. So many things formerly produced in the home are now made in factories. In a city home

there is scarcely anything for a boy to do, and much less than formerly for girls.

This, however, is not the only cause of the lack of a sense of responsibility among our young people. There has commonly been an absurd extension of the democratic idea of self-government in the home and in the school. Children openly boast, with evident reason, their independence of parental control. This attitude inevitably carries over into the school, where, sometimes, an oversoft pedagogy fosters it. Or, if the school insists upon obedience and prompt, efficient discharge of daily duty, the coddling parents interfere. In some American families this alleged democracy becomes in reality an absolute monarchy with the child on the throne. The result is usually written large, shame and sorrow for the parents, and life failure for the child.

A Comparison.—What can manual arts and industries in the schools do toward counteracting these tendencies, more than may be done by the academic studies? Perhaps nothing more than *may* be done, because, if the academic studies are so planned that they appeal to the interests of the students, and if the requirements are exacting the student must learn to assume responsibility. There is, however, an important difference in the nature of the two kinds of work. In academic studies it is very difficult, often practically impossible, to estimate accurately a pupil's effort. A selection of literature may be studied

thoroughly or in the most superficial way, and the teacher may not discover the difference. Very young children learn the arts of shirking and simulating, and older students become experts in these arts. In work in the shops, the kitchen, the sewing room, or the school garden failure of any kind is easily detected. When a pupil undertakes to make a garment, a bookrack, a loaf of bread, he can readily be held responsible for every step in the process, for the time spent upon it, and for the character of the completed product. There is always a product that stands for the effort, for the attention to details, and to both teacher and pupil there is a certain standard to be attained. Even though the work sometimes becomes distasteful, the sense of increasing skill, together with the final completion, brings a degree of satisfaction that is ample reward for the conscious effort required, and good preparation for subsequent undertakings. When a child acquires toward certain activities the attitude: This ought to be done, shall be done to the best of my ability, he has learned the lesson of responsibility. Through a regular series of undertakings this attitude becomes habitual toward all work that for any sufficient reasons seems worth doing.

Sense of Efficiency.—With the accomplishment of each undertaking comes an increased sense of skill and efficiency. Society is burdened with inefficient men and women. They do not know the love of accomplishment,

the joy that comes from a sense of skill in any occupation. Experience demonstrates that one of the very obvious results of work in the shop, in the sewing room, or in the cooking class, is the development of this sense of ability to do things well. Every piece of work proclaims in clearest tones the efficiency or inefficiency of the worker. If good, it wins for the young worker social approval in the class, in his home, to some extent, in the community. All this tends to develop self-respect, self-reliance, a sense of power and skill that is basal in good character.

Integrity.—This topic is taken up mainly because the claim is commonly made that training in manual occupations has special value as a means of developing a sense of honor and integrity, while opponents of the general introduction of this work into the schools protest that shop or kitchen work has no more influence upon the sense of honor than work in general academic studies. Probably the latter are right. Otherwise we should expect to find higher standards of integrity among skilled dressmakers and carpenters than among teachers and doctors.

The real significance of this aspect of our problem lies in two considerations: *First,* the general one already referred to, namely, that the habit of industry in some legitimate occupation is a prime condition of general morality including integrity. The schools have heretofore

continually aimed to prepare boys and girls for professional careers, or for unproductive lives of leisure, rather than for manual occupations. Elementary school work has centered about the three R's. In earlier days when children received training in manual occupations in the home the conditions were fairly satisfactory, but conditions are greatly changed. A very large number of children now have but little in the way of manual occupation or responsibility, still less of systematic training, in the home. Out of school hours they play, read, practice music (all of which is good), but they do not learn to work with their hands. There can be no question that a training that gives a boy or girl a sense of ability to control material things, that leads to frequent experience of satisfaction through producing something worth while, is a great moral force. The new industrial and social conditions demand that this training be given in the schools.

Second, the value of training in manual arts and domestic science as a means of developing integrity and a fine sense of honor depends very largely upon the character of that training. If copies of designs are passed off as originals, if putty, wood-stain, and varnish are used to hide poor materials or careless workmanship, if birch is made to pass for mahogany, or maple for quarter-sawed oak, if seams are loose and unfinished, in a word, if handwork is not genuine, if it is intended to deceive, the effect upon the worker is demoralizing. The

opposite is obvious. If pupils are trained to use good materials, to measure and weigh accurately, to do work that will bear inspection inside and out; if the training leads them to see and appreciate the difference between sincerity and sham, it cannot fail to develop moral fibers of genuine integrity. This is the more certain because, while pretence in a recitation is elusive, in handwork the product stands with more or less permanence to commend or condemn.

Will Training.—Regarding attention and volition Professor Angell says: "No idea can dominate our movements which does not catch and hold our attention. Indeed, volition as a strictly mental affair is neither more nor less than a matter of attention. When we keep our attention firmly fixed upon a line of conduct, to the exclusion of all competitors, our decision is already made." [1]

This suggests one element in the effect of manual occupations upon the development of the will. We have already seen in Chapter VI how attention is the prime factor in development of motor control, that is, of skill in manual occupations. There appears to be only one other element of special interest in this connection. Work of this kind involves enterprises having remote ends, and a certain series of activities. The only way to attain the desired end is by careful attention to each step and by

[1] Angell, "Psychology," page 402.

persistent effort. This necessity for close attention to all the conditions involved, for prompt response to the "will to act," for untiring effort until the project is completed, is the special means of will training through these occupations.

CHAPTER XI

Economic and Industrial Values

Isolation of the School.—Our schools have become strangely isolated from the industrial life of the vast majority of the people. Ninety per cent of our children do not enter high school. Fewer than half of those who enter remain to complete the course. The curriculum of the elementary school is made to prepare students for the high school, that of the high school to prepare for college. The colleges, in the main, prepare for the professions. So far as school training goes, the ninety or ninety-five per cent of pupils who drop out early are prepared for none of the world's industrial activities, in which, perforce, they must engage. Have we a right to claim that we are educating for efficiency?

Examples.—There is no industry in which a liberal special education pays a larger increase in return than farming. Probably not one farmer's son in fifty is receiving, in the public schools, the special instruction and training he needs to even start him right. The great majority of boys in towns and cities will find their life work in manual occupations. The schools are doing little toward preparing boys for any kind of manual work. The vocation of the great majority of women will continue to

be "home-making," and yet the arts of home-making are only beginning to find a place in our school curricula.

A Problem.—How can the general introduction of manual arts and domestic science affect this situation? First, let us consider the case of boys on the farm. How can the rural school better prepare them for their life work?

Elementary Agricultural Schools.—The answer is obvious, when one really thinks about it. The best kind of school for farmers' sons is an elementary agricultural school. It should teach the usual academic subjects, to be sure, but it should in the last two or three years, to some extent, specialize in agriculture. For such a school the first requisite is a prepared teacher. At present such teachers are rare, but that is only a matter of readjustment. Teachers have always prepared for what was required of them. In this case probably the best preparation is a willingness to learn. The next absolute necessity is a small experimental farm, a "school garden," if you prefer to call it such. Finally, there should be a textbook which presents the science of farming in a very simple way, gives directions for simple, practical experiments, and provides a course in farm arithmetic applying the theory.

Results.—From such a school, a consolidated rural school if possible, the following results may be expected:

1. Farmers' sons will continue in school longer, will

do their academic work as well or better, and instead of getting less academic training will probably get more.

2. The interest aroused in the practical problems of the farm will lead many to continue the study in some more advanced agricultural school. Whether at school or on the farm they will continue to be students of the science of agriculture.

3. The intellectual interests in scientific farming, together with the assurance of increased profits, will keep the brighter boys from leaving the farm to spend their lives in the city in occupations generally less profitable and less satisfying.

4. Farming will be not only much more profitable, but vastly more enjoyable because the constantly developing new ideas will relieve the old-time monotony, and give the satisfaction which always comes with progress and success.

More Advanced Work.—If special work in agriculture be carried along in continuation classes in the centralized rural schools, or in the local high schools, the majority of farmers' sons might continue as students four or five months each year until seventeen or eighteen years of age.

Special Courses for Girls.—The same general principles apply in regard to the education of girls. Just as agriculture is the most important, and under right conditions, the most interesting industry for men in the world,

so domestic science and household arts are the most important, and, under right conditions, the most interesting vocations for women.

The same method of providing for such training applies as in the case of agriculture, with this difference, that no distinction need in this case be made between rural and urban schools. During the last two or three years in all elementary schools there should be for girls special classes for theoretical instruction and practical training in all that pertains to home-making. In the continuation classes in the consolidated rural schools, and in the local high schools, this work should gradually become more highly specialized.

Results.—From such an articulation of the school with the home, with the real normal life of young girlhood, we should expect the following results:

1. A very material lengthening of the school life of ninety per cent of American girls.

2. Better general results in academic education, because of extension of the time, the elimination of much useless and uninteresting material from the academic courses, and more vital interest in what remains.

3. A very marked improvement in the home life of the people, because the school instruction and training would immediately carry over into the home. To be specific, there would result more sanitary conditions in and about the home, more wholesome, nutritious and less

expensive foods, better health, more attractive and more comfortable home furnishings.

4. When the "homemakers" become more intelligent regarding their work, more skillful and more artistic in performing it, that work will take on the dignity of both science and art. Then the glory of the American woman will be her home.

The Problem of the City Boy.—This leaves the boys of the villages, towns, and cities to be considered. The majority of these will find their life work in some kind of manual trade; the minority in commercial occupations. For reasons already stated, all should have training in manual arts. For the majority, this will be especially valuable in that it supplies a general fundamental training leading directly toward the manual occupations to which they are to devote their lives. Perhaps in the latter part of the elementary school course, certainly not later than the beginning of the continuation or high school work, there should be elective courses for these two classes of boys. First, greater specialization in manual training leading directly into the trade schools and technical schools, and second, commercial courses preparing boys who look forward to a business career. With these special courses there should, of course, be carried on only the most important, vital, appropriate portions of the present academic courses.

Results.—From some such gradual specialization in elementary and secondary school work the results may be easily inferred.

1. A general extension of the school life of boys in urban communities, because boys will see the immediate value of the kind of training provided.

2. A higher average of academic education, for reasons already given.

3. Fewer misfits in vocation, and fewer youths drifting along without definite aim as to vocation.

4. More skillful and efficient workmen in manual trades as well as in commercial callings.

5. A more intelligent, more prosperous, more optimistic mass of urban citizens

Another Problem.—Before leaving this part of the subject one other suggestion seems necessary. In the case of farmers' sons there is no serious difficulty about a division of time so that the boys may spend part of their time at school and part on the farm helping with the work and getting the practical experience. The same is true of the training in "home-making" arts for girls. But as yet we have not in America, except in night schools, any plan by which boys and girls may continue in school part of the time while earning some money, rendering some practical service to others, and at the same time acquiring experience and skill in the line of

work for which they wish to prepare themselves as thoroughly as possible.

Possible Solution.—The European "continuation schools" are working out a plan of solving this problem. Students are divided into equal alternating groups. The members of Group A are in school for a time, while the members of Group B are at work in shop, in a business house, or at domestic service. Then for an equal period of time the members of these two groups exchange places. These alternations are repeated again and again during this period of the concurrent vocational and special school training.

The details of such a plan must depend upon the peculiar conditions involved, especially on the employment side. In the interests of the boys and girls it would seem desirable, when possible, that they work half the day and study the other half, but weekly, fortnightly, or even monthly periods may prove quite satisfactory.

With the organization of a system of schools along the lines of the general plan here outlined, there seems no reason why a very large majority of boys and girls should not voluntarily continue in school until seventeen or eighteen years of age. This would ensure much more academic culture than is now general, would develop much more of the student attitude, and provide for a large measure of vocational training.

It may be said that this proposed scheme of education does not provide for those who look forward to a professional career, or for those who wish education for its cultural value. That is quite true. In this discussion it is assumed that the present system especially provides for these two classes. The early training in manual arts and industries is fundamental to the development of all, but for those to whom efficiency and satisfaction in life's work depends upon the cooperation of hand and brain, training of this sort should be continued with increasing emphasis along gradually differentiating lines.

CHAPTER XII

Social Values

Class Distinctions General.—Social changes are necessarily of slow growth. Among all peoples the evolution of the social organization has always developed certain stratifications. There are always at least upper, middle, and lower classes of people. Various factors enter into this process of stratification. Primarily it is often a mere matter of wealth, or show of wealth. To some extent it may depend upon the evidences of literary and scientific culture. Another important factor is occupation, partly because of the estimation of the value of the service and the varying remuneration, and partly because of the difference in personal appearance that may be maintained while engaged in the occupation. There is a prevalent idea that any occupation in which one may always wear good clothes, or at least keep up good personal appearance, gives him a better social standing than one in which it is difficult or impossible to maintain appearances.

The fact that these ideas cause distinct stratifications in society shows how strongly they characterize the social mind, and how difficult it is to bring about any significant changes in social conceptions.

Labor vs. Capital.—Another very important problem of the day is the adjustment of the relative interests of "labor" and "capital." While this is primarily an economic problem, it has its distinct social significance. We hear much of the "dignity of labor," but nothing of the dignity of capital. Is it because the latter is self-evident while the former has to be self-proclaimed? Is it because labor doubts its own dignity? Furthermore, is there not some real ground for this distinction?

Whatever is essentially wrong can be corrected by the right kind of education. Judging the future by the past we recognize that important social changes are matters of evolution; not of revolution. Hence we are ready to urge and promote movements which can only come into full fruition in later generations.

A Common Misconception.—The absurdity of the social distinction so commonly based upon occupation is admirably brought out in a story told by Miss Addams:

> "A Chicago manufacturer tells a story of twin boys whom he befriended and meant to give a start in life. He sent them to the Athenæum for several winters as a preparatory business training, and then took them into his office, where they speedily became known as the bright one and the stupid one. The stupid one (so-called), was finally dismissed after repeated trials, when, to the surprise of the entire

establishment, he quickly betook himself to the shop, where he became a wide-awake and valuable workman. His chagrined benefactor, in telling the story, admits that he himself had fallen a victim to his own business training, and his early notion of rising in life. In reality he had merely followed the lead of most benevolent people who help poor boys. They test the success of their effort by the number whom they have taken out of factory work into some other higher occupation." [1]

This idea, that work in an office, or some other place, where one may keep his hands soft and his linen clean, is higher, more respectable, more worthy than efficient productive hand work in shop or factory or kitchen seems to have no basis in common sense, but we shall return to that topic for fuller discussion later.

Evolution in Occupations.—The attitude of society toward various occupations may be clearly seen by studying the evolution of certain vocations. For example, there was a time when barbers acted as dentists and surgeons. Their dentistry was limited to extracting teeth, and their surgery generally to "blood-letting." They were not supposed to be very skillful, and the fees for these services were probably about the same as for shaving and hair-cutting. Now, in practice, both dentis-

[1] Jane Addams, Democracy and Social Ethics, page 196.

try and surgery are distinctly manual occupations, but society recognizes that successful practice requires much technical knowledge and a degree of skill that can only be acquired by long, careful training.

Or let us take another example, where the evolution is all quite recent. Little more than a quarter of a century ago nearly all nursing was done by persons without special training. In social standing and in remuneration the old-time nurse took rank with other domestic help. Then within a few years special training schools for nurses were organized in connection with hospitals all over the country. Young women of fair academic education are taken in for a time "on probation." If they show satisfactory qualifications, and wish to continue, they spend from two to three years learning the "theory and art of nursing." What is the result? There is now a very large number of "trained nurses" who in professional ranking, might be designated assistant physicians or assistant surgeons; who are generally admitted to the best society; and whose remuneration is two or three times that of the untrained nurse.

Of course, we must remember that an important factor in the social evolution of these vocations is the inestimable value that may attach to the services they are prepared to render, but our point is that the ability to render those services is conditioned by the extent and thoroughness of the preparation.

With this general survey of the conditions pertaining to our specific problem let us try to discover in what ways, if any, the general teaching of manual arts and industries can be expected to have any influence upon undesirable social conditions.

Advantages to Laboring Classes.—First, what are the possible results as regards the social condition of the working classes in general? We have pointed out that the logical consequence of manual arts in the schools is the organization and maintenance of industrial schools in which some important academic work also will be carried on. From well conducted schools of this kind two results must surely flow. In the first place, men trained in such schools will be more skillful and efficient. Their earning power will be increased, their self-respect will be raised, their home life will be improved, and their general social standing will be enhanced. In the second place, the prolonged schooling in both academic and industrial work will result in a general rise in intelligence among the laboring classes. Notwithstanding our deep sympathy with "labor," our general approval of the efforts made to improve the economic and social conditions of laboring people, our admiration for some of the leaders of organized labor, we cannot but deplore the fact that large labor organizations have sometimes been very badly led. This has been possible because men and women have not been quick to recognize the self-seeking,

insincere man who appeals to their prejudices that he may impose upon them. Under these conditions the interests of the working people have often been sacrificed to capital. The only remedy for this is a higher average intelligence among the rank and file of working people.

Results in Mode of Living.—The beneficial results of the general teaching, in the right way, of domestic science and household arts can scarcely be over-estimated. It has already been observed that in places where good courses in these lines have been provided, there is a marked change in the domestic life in many homes. The untrained mother does not know what foods have high nutritive value in proportion to their cost, which are easy and which difficult to digest, how best to prepare them to secure wholesome results. All of these things are taught the daughters in the domestic science classes. The immediate results may be mainly economic and hygienic, but the ultimate results in that home and in the future homes of the daughters will be social as well.

We have said that one reason for the social recognition of physicians and trained nurses is the value attached to their services. We may yet come to see that the services of a well trained cook in preserving and promoting health, especially among growing children, are even more valuable than those of the physician in his efforts to restore lost health.

Many a farmer knows thoroughly how to feed his young colts, calves, and pigs so as to ensure most healthy, vigorous growth. At the same time his children grow slowly, are pale, and anaemic, and neither father nor mother suspect that their condition is probably due to the kind of food they get. This, of course, is directly hygiene; indirectly it has important social relations because prevailing illness is unfavorable to social development.

Social Results in Rural Life.—Finally, let us consider the effect of better agricultural education. Here again the results will be, first, increased profits, increased prosperity, better home conditions, greater self-respect, hence, greater respect from others. As in the case of other working people the prolongation of school life will result in a higher average of intelligence and culture. The centralized school will become a social center, there will be a library open to the community, an assembly room for the meeting of various clubs or other social organizations. The laboratory of the school will be open to the growing farmer to test his soils, fertilizers, etc., and to the young housewife to continue her domestic science studies. Such a school should be a genuine educational "extension" center. Increased prosperity will make it possible for rural people to devote more time to recreation, to reading, to travel, to art, and all that tends to social improvement.

General Conclusion.—In general, when a large majority of our boys and girls continue in school longer, carrying along academic studies with vocational training, they can be led to choose vocations more wisely. They may be led to see that success depends upon skill and industry, that such an occupation as farming can utilize to the fullest extent a preparation as extensive and thorough as that required by a physician or a college instructor. Then, too, in this evolution, boys and girls may be led to see the folly of leaving the farm for the city, or of leaving shopwork or housework for work at a desk or at a counter, because it will be seen that, generally, these changes are not favorable to material prosperity, or in physical health, and that the apparent social advantages have no basis in reality.

CHAPTER XIII

Habit and Attention in Relation to Manual Arts and Industries in Education

In the beginning of this, our last distinctly psychological chapter, let us gather up and formally state some fundamental conceptions of psychology in relation to education.

Life.—We may define life as an activity having the power of self-direction, of adaptation, and of continuous development. It involves two interdependent factors, the physical and the psychical.

Psycho-physical Parallelism.—Practically all modern psychologists are agreed that every psychical act is accompanied by a corresponding physical activity within the central nervous system, that every change in the central nervous system is accompanied by corresponding psychical activity.

Physical Elements Essential to Life.—

1. A nutritive system, the means of sustaining life and promoting growth.

2. A nervous system, the means of communication with the environment, and of motor control.

3. A muscular system, the means of movement.

Psychical Factors in Development.—

1. Sensation, awareness of physical stimuli.

2. Cognition, all forms of knowing.
3. Feeling, emotional attitude toward experience.
4. Attention, the organizing mode of activity.
5. Habit, the means of capitalizing experience.
6. Volition, the power to determine action.

Education.—The process of reorganizing experience. In a desirable education this reorganization tends to develop judgment, appreciation of what is of most real value in life, and the ability to attain and conserve those values.

Habit and Attention.—Out of their setting among these basal concepts let us take *habit and attention* for our special consideration. We have characterized habit as a means of capitalizing experience. In our study of the development of motor control we saw that the attention is the most important factor in the development of control. Now it is the function of habit to gradually relieve the necessity for giving attention to an activity, and attention thus becomes free to devote its powerful and necessary energy in securing other forms of control. For example, if I were learning to write Hebrew, I should have to give close attention to the details of the formation of the letters, but in English I have a writing habit that carries the process on rapidly while attention is occupied with the organization of the thought and the mode of its expression. Habit has stored up and placed at my command the experience of my earlier years in

learning to write. The idea that one can learn to write just as well while writing an original story as while giving all of his attention to the form and movement in writing is a psychological absurdity.

Balance Between Habit and Attention.—The normal condition is a sort of balance between attention and habit. They are mutually dependent. A new habit can be formed only with the aid of attention. The more intense the attention the sooner the activity can be largely turned over to habit,—and attention released to guide other activities. Any disturbance of this balance tends to throw the mental machinery out of gear. Excessive habit formation tends to arrest development by limiting interests and activities to past experience, while a lack of habit would make it necessary to give an equal amount of attention to every action consciously performed. The problem of formal education in this connection is to maintain a proper balance between the tendency to form habits and the degree of attention required in the development of conscious power in an ever enlarging range of activities.

Value of Practice.—Opponents of manual arts and industries in the schools have sometimes taken the ground that there is but little educational value in manual activities because, they say, when one has done a thing once he has gained all he can educationally from that particular activity. If by this they mean that when a

boy has once sawed to a line, has once driven a nail just right, or that when a girl has once cut out a waist, or made a loaf of bread, that after one successful effort there is nothing to be gained by efforts to repeat that success, they surely do not know the meaning of the development of confidence and skill. That first success may have been in part uncontrolled; several subsequent attempts may be failures. As well might one say that after a pupil has written one good piece of English prose he need write no more English prose, he has attained all the educational value from that kind of experience. We all believe that the first success will *tend* to secure a second success, that the power generated in these two successful efforts makes it easier to secure a third, and so on until writing good prose becomes more or less a habit; but it is doubtful that in this case attention can ever be to any marked extent released. In acquiring skill in a manual art the release of attention may be more rapid and more perceptible, but it is always a gradual process.

A Possible Danger.—There is, perhaps, a real danger in emphasizing manual training in elementary schools, and it may be this that these critics have had vaguely in mind. The early attainment of skill is likely to center interest in that kind of activity, and arrest development along other lines. If a boy, for example, becomes interested in wood-work in the shop to the prac-

tical exclusion of all other lines of work, if he attains a degree of skill in that work and therewith becomes satisfied, he may devote himself exclusively to that, leave school early to work in a shop or factory, and from that time on his general education is likely to be very much retarded.

Example.—The appreticeship system furnishes a good example of this tendency. A boy of fourteen is bound to a master mechanic for a term of seven years to learn a trade. (It may be noted in passing that in the same time he could almost complete a high school and college course, and under favorable conditions, he could learn any mechanical trade while getting his high school and college training.) The boy is bound under contract, to his employer for seven years to learn to do one thing. He is not supposed to have any interest in any other kind of occupation. In general, where the apprenticeship system has been in use, the hours of work were too long to admit of time for other interests. There was no way of shortening the period of service, except by desertion, and no way of increasing the compensation by special efficiency. At twenty-one years of age the man was usually a good mechanic, but he was nothing more. The educative process was not absolutely stopped but it was very much retarded. On the physiological side a limited number of nervous cells had become closely associated, the pathways for stimuli had

become established, other large areas were relatively undeveloped.

Condition of Growth.—Continuous growth and development requires an ever widening range of interests and activities. The educative process becomes retarded only when interests center in, and become restricted to, some limited field of activities. But if one constantly flits from one interest and its related activity to another, then to another, he becomes a "jack of all trades and master of none." The development of efficiency in any special line of activity requires practice, but, as we have seen, this practice should be at frequent, regular intervals and accompanied by concentrated attention. This is the direct route to skill in any field of endeavor. In childhood and early youth, however, no one line of interest or activity should occupy a large proportion of time and attention. The child's natural love of change is nature's method of providing for an all round development. Different brain centers are constantly being stimulated and exercised, different associations established through the various possible pathways, different sensory and motor coordinations formed, the whole organization maintained in a plastic condition favorable to growth. So far as possible, this condition should be presented during youth. While the development of control of some desirable activity, of a skillful habit of doing some thing, demands concentration and regular

practice, there should be carried along with that a variety of other interests and activities.

Application.—The application of this important, far-reaching principle to manual arts and industries is obvious. When school work is exclusively of an academic character and the home provides no other special interests and occupations, a limited number of children have their interests centered in the little world of book learning. These, if they can, voluntarily continue in school, and, unless other interests are aroused later, their education is likely to be dominated by books. But, a very large number develop little genuine interest in academic studies. These, and, for various reasons, many others, leave school early. Most of them devote themselves almost exclusively to some kind of manual occupation. Their interests, their attention, their chief activities, largely center in some more or less mechanical routine. Their life experiences may be somewhat more varied than that of the bound apprentice, and they may work at one thing for a time, then at another, but academic studies and other wholesome interests are, in most cases, excluded. The educative process is accordingly restricted in its scope and retarded in its movement. Habit formation, within narrow limits, hampers attention and restricts the development of new interests and of new forms of control.

Suppose, however, that various kinds of manual and household arts are a part of the regular school work. At once the interests and activities are varied and multiplied. Then, suppose, that practically all children continue in school at least half of each day, or a considerable part of each year, until seventeen or eighteen years of age: think what that would mean for the continued growth and development of the nine-tenths of our boys and girls who now leave school early. Such a plan provides for continuous play of that balance of habit and attention which is a condition of growth and, at the same time, of the development of practical skill and efficiency.

CHAPTER XIV

To Whom Training in Manual Arts and Industries is Most Important

Physiological psychology clearly shows that early formal education should include a large amount of neuro-muscular training. This naturally includes much training in manual activities. It has been pointed out in Chapter II that the early conception of manual training in this country placed it first in technical and high schools. Then it gradually found its way into the upper grades of the elementary school, and it is only recently that many schools have allowed boys of the fifth and sixth grades to take work in the shops. To a considerable extent the practice has rather reversed the application of the true educational conception of manual arts and industries. Perhaps it would be better to say that we have not had too much manual training in the high school, but quite too little in the elementary school, and especially in the lower and intermediate grades of that school.

Importance to Young Children.—Because the sensory and motor impulses are usually strong in young children they present a condition that must be met. Generally the children will strive very hard to find some way of expressing these dominant impulses. If the school does not provide for their expression so much the worse for

the school; it has a problem in repression. If it succeeds in repression, so much the worse for the children. It is true that, under right conditions, many kinds of children's games do much for the development of motor control, but it must be remembered that play has its limitations. Play alone can never express the impulse to make, to decorate, to own, to design and plan, to produce something of value. For expression and development along these lines the young child needs much regular training in various forms of manual arts.

Probably the hardest task for most teachers of children, from seven or eight to ten or eleven years of age, is to interest their pupils in much of the text-book work provided in the usual course of study, but there is rarely any difficulty about interesting these same pupils in manual training, domestic science, or school gardening. They are eager to do things, to make or produce things. It follows, then, that since the dominating impulses of young children demand much in the way of manual activity, and do not demand much in the way of book knowledge, that during the first four or five years of the elementary school course there should be distinct emphasis upon those lines of work that require physical activity in games and occupations.

Precaution.—Here, again, a word of caution seems necessary. In some school systems the demand for manual occupations in the first half of the elementary school

course has quite outrun the preparation to meet it. Such work as paper cutting and folding is no doubt interesting and valuable in the kindergarten and even in first and second grades, but for older children it does not seem "worth while." The same general criticism applies to much of the work with cardboard and to the whittling exercises. It is not enough that children shall have "occupation in manual activities." Nay, more, it is not enough that children *seem* to like the occupation provided. This attitude sometimes expresses only a covert satisfaction in escaping for the time the "book lessons." Many children would rather "serve time" at almost any kind of handwork than at some kinds of study. The occupations should have definite aims looking to the production of something that seems to the children themselves genuinely worth while.

A Question of Aim.—But, say the advocates of book education, young children are unable to do anything in manual arts and domestic science that is really worth while. They cannot be expected to have sufficient knowledge of materials, control of tools and of processes to produce things of real value. In many cases, measured by adult standards, that may be true. But that is not the point of view here urged. The aim of this work in the schools is the development of efficient boys and girls, not the production of tables and tabourets, of pies and pinafores. The best teachers of drawing in elemen-

tary schools long since repudiated the idea that their aim is that their pupils shall produce works of art. They aim to give training in expression through lines, light and shade and colors, to develop a sense for good form and proportion, for harmony in color, and an appreciation of what is good in industrial design. So in all our schoolwork, it is not what the child produces that is the real aim of the school, but the effect of the effort upon the learner, the development of an appreciation of real values, and of the power to control those values. Hence it is of supreme importance that the work undertaken should seem of real value to the child. And it is with this condition distinctly understood that training in manual arts and industries is urged as of supreme importance for children from seven to twelve years of age.

Application.—Here arises a minor question. Does this principle apply equally to all children? The answer must be, No. That is to say, all children should have abundant opportunity for the expression of their impulses to sense perception, to motor activity, to make and produce things, but home conditions still do much more for some children in this respect than for others. In a well conducted country home the children early come to share to some extent in the simpler and lighter forms of occupations. They thus get many experiences that are practically impossible to most children in an urban home. Even the boys and girls, however, in the

best country home may be greatly helped by some systematic training in shopwork, gardening, sewing, and cooking. Where the rural home conditions are not good the need for this school training may be in every respect as urgent as it is for any class of city children.

The Centralized School.—One of the important advantages of the centralized rural school is that in it adequate provision can much more readily and economically be made for all these lines of work than in the small district school, and the work can be more specialized for the older children. The girls can work out, in both theory and practice, the manifold problems of domestic economy, of home sanitation and decoration; while the boys attack the equally manifold and interesting problems of general and special agriculture, and, at the same time, in the shop get some of the mechanical skill that every farmer should have.

Special Value to City Child.—The urban child, however, is now especially cut off from home opportunities for manual experiences. Even in villages this is commonly true. The garden spot is usually small, and for one reason or another the garden work is generally done exclusively by adult members of the family. Children are not trained to take their share of the valuable experiences such work offers. Food and clothing are to a very large extent prepared outside the home. Even playthings of almost every kind come into the home

ready made. There was a time, not very remote, when the boys made their own baseballs and bats, their hockey sticks, their wagons and sleds. Then, too, little girls made and dressed their own dolls, made and furnished their own doll's house. Vastly more important than this was the fact that both girls and boys had their respective shares in the duties and responsibilities of the home life. In many homes nearly all of this has been eliminated, with great disadvantage to the children.

The school has been established and is maintained to provide certain experiences, that in the changed social and industrial conditions cannot be supplied in the home. Therefore it is peculiarly necessary that various forms of manual and household arts, judiciously selected and directed, should form a part of the daily work.

Importance to Lower Races.—To understand the special value of training in manual arts and industries to children in relatively lower stages of civilization it is necessary to consider three points:

First, that in persons in the lower stages of civilization the motor and sensory impulses and interests occupy a larger place in the sum of their activities than in those in whom the higher nervous centers have been more fully developed. To attempt to give persons in this stage of human evolution very much in the way of literary and scientific training is likely to prove futile. Preparation for that kind of education can come only

through generations of training in which there is a constant effort to work from sensori-motor activities to reflective activities. The sensori-motor experiences must be more varied, must stimulate more numerous and more varied intellectual and emotional experiences. In other words, the person in a lower stage of civilization continues in the condition of the child of civilization, hence the training best adapted to such a child is, in general, likely to be the best for the member of the lower race.

Second, if it is true that differentiation and specialization in nervous tissue depends primarily, in part at least, upon the number and variety of neuro-muscular experiences it follows that either races or individuals in a lower stage of development need just that sort of experience as a means of evolution or development to a higher stage.

Third, in probably the vast majority of cases the individuals of the less developed race will find their life work in occupations that involve mainly skill in manual training and domestic arts. When once it becomes recognized that training in these things means education there will be an increasing number willing to go on with work in special schools. The intellectual interests in the manual occupations will to some extent carry over to academic studies and the ultimate results will be not only more skillful working people, but a higher general average of intelligence and culture.

Specific Application.—To make a specific application of this principle, it seems beyond question that the rise and progress of millions of the colored boys and girls of this country must be through education in various forms of industrial occupations. To such a people as a race that seems the way to genuine freedom, to acceptable service, to personal self-realization, to home comforts and the possession of property.

Importance to the Sub-normal Child.—In theory it must appear quite probable that the kind of training that should be emphasized in the education of the young child of civilization, and in the education of both childhood and youth in lower races, will be most beneficial in the education of the feeble-minded child. Careful experimentation and extensive experience in a number of institutions for feeble-minded children very completely establish this theory.

As regards intellect, the most obvious symptom of feeble-mindedness is the lack of the power of attention. Now, it has been frequently observed that some form of manual occupation, the manipulation of materials to some definite end, is the best means of developing the power of attention in the sub-normal child. When a child can be led through some manual work in which he takes an interest, to regular oft-repeated experiences of this kind, day in and day out, he cannot fail to give attention and to develop a power and a habit

of attention that carries over to other interests and activities. The reason is that the sensori-motor experiences give a body of images, related and associated, which become the raw material of constructive imagination, conception, judgment, and reason. From the point of view of his intellectual development, therefore, the best that can be done for the sub-normal child is to give him extensive training in various motor activities, including manual arts and industries. If the work provided appeals to him as worth while for its own sake so much the better. But if he seems indifferent to all projects some indirect interest should be appealed to.

Here again the probable future of the individual emphasizes the value of this kind of training, for, if the sub-normal child is ever to become independent, self-reliant, and self-sustaining it will probably be through some form of manual activity.

CHAPTER XV

General Method

Reference has several times been made to the way in which instruction and training in manual arts and industries should be given. While it is entirely beyond the scope of this work to give detailed plans and directions, it seems desirable to suggest some general principles that may serve as guides in planning and carrying on the work. As in every new movement of this sort, there has been in school work in manual arts great waste of time and effort because teachers have not known what is most worth doing, and how best to do it to secure the most valuable results in the development of the pupils. This is but natural. The whole movement has been, and is still largely, in a process of experimental evolution. In such a process we find our way only through the recognition of misdirected efforts and failures as well as successes. There are still many problems to solve and any earnest, alert, thoughtful teacher can contribute to the further development of the movement in its various ramifications.

Motive.—The fundamental conception underlying all method should be motive, that impelling force within us which prompt all purposeful action. A part of the great problem of education is the recognition, utilization, and development of right motives to activity, to conduct in

its broadest meaning. It has been shown that children are naturally impelled to various forms of manual activities. If observation be carried farther it will be clear that some lines of these activities attract nearly all children, some attract very few. Moreover, while nearly all children like to plant things and to see them grow, this kind of work may be directed and conducted in such a way as to kill interest and develop the utmost indifference, or in such a way as to continually increase in interest and satisfaction. Every one knows how commonly boys like to use tools, how eagerly they welcome the opportunities of the manual training shop, and yet the writer has known a number of normal boys who began this work with great enthusiasm, to ask to be excused from the shop after a few weeks' experience. In a few cases, when an attempt was made to compel attendance, they played truant during the shop period.

There can be little question that such a condition is due to a failure on the part of the school to utilize or develop right motives, or to carry on the work in a satisfactory way. The writer has frequently asked boys in a shop what they were making and been told, "I don't know." The boys had simply been given pieces of wood and told to make them of a certain size. Later, they were told that the piece was to be part of a box, a book-rack, or a bird house, but in the beginning there was no real motive for the work.

Principles Relating to Motive.—This prepares us for the statement of three general principles governing method:

First, the work should be such as the great majority of pupils will naturally wish to do, and will give satisfaction when completed. The second part of this is as important as the first. There may be exceptions to the rule, but generally speaking, when a pupil casts aside, as of no value, the piece of handwork he has completed, he might better not have begun it. His attitude toward subsequent projects is not so good as it would have been had he not had that more or less disappointing experience.

Second, if the work is not obviously such as seems to the pupils worth while, it should be so explained to them that they see the value of it. In this way a good direct interest and personal motive may often be developed.

Third, if what seems the most desirable work for a certain group of pupils at a certain stage does not appeal to some immediate personal motive, recourse must be had to some good indirect motive. For example, they may produce things for the use of the school, or to donate to some charity, or for a friend or relative.

In accordance with these principles it follows that the teacher determines in a general broad way the work to be done, that is to say, makes the general course of

study, but makes it with reference to the known interests, aptitudes, and powers of the pupils.

Within this general plan, however, each pupil should be allowed as much freedom as possible, not only in the selection of his special projects, but also as to the method of working them out. It must be remembered that the aim of the school is the development of the pupil, and that he is developed, not by what others do for him, but only by what he does for himself. When everything is prescribed for him in detail very much of the value of the work is lost.

Exercises vs. Personal Projects.—This leads us to consider the value and place of "exercise" projects as compared with the so-called "useful" projects. The "exercise" in manual training and domestic arts is a "practice piece" designed to develop skill as a preparation for making things of value in themselves. The Russian system of manual training, for example, consisted almost wholly of instruction in the uses and care of tools and work upon "exercises." The student was not supposed to undertake to make anything that could be put to any practical use. Swedish Sloyd was considered a marked advance upon the Russian system in that the things made were supposed to be useful household articles. In America, however, Sloyd was soon superseded because it was found that many of these "useful" articles were rarely used in the American home. Owing to the comparative failure of these systems some ad-

vocates swung away from all forms of exercises, urging that boys should learn to make joints by making joints as they occur in boxes, book cases, tables, chairs, etc., and that girls should learn to make buttonholes, by making buttonholes as needed in a waist or other garment.

Neither of these plans show ordinary common sense. The plan which keeps pupils long practicing upon exercise pieces alone violates utterly our fundamental principle that, generally, the work should appeal to the pupils as aiming to produce something that is genuinely worth while in itself. On the other hand, when pupils undertake to make things for which they have not acquired the necessary technical skill, they frequently destroy much good material, waste much time, become discouraged by their failures, and finish their projects in an unsatisfactory way.

The practice exercise has its value in its proper time and place. It is vicious only when made an end in itself or when to the pupil the real end is so remote as to fail to affect his motive. When pupils begin shop work in wood they are quite willing to do a little practicing in sawing to a line, in planing a surface smooth, and in trying to get two smooth surfaces at right angles to each other. They feel that they need this skill before they do anything worth while. The motive to work is very real and personal. Similarly, when a girl gets to where she needs to be able to make a good, neat buttonhole, she is quite willing to take a piece of practice

cloth and work buttonholes until she is satisfied she can do it well enough to put them into her garment. The desired skill has a value just as real and personal as the garment itself.

Fourth Principle.—Hence we have our next principle. Work in manual arts should be mainly upon projects that the pupils themselves wish to undertake looking to the production of something of real value to them. But, practice exercises should also be given. This practice for skill in some step in a process should be given generally only when there is immediate need of it, so that the pupils feel the relation between the practice and the end for which the skill is necessary.

Models.—The use of models is another factor in method. If the preceding principles are understood the proper use of models will be obvious. *First,* good models are always valuable as objects of study, to give basal conceptions of things to be made and to set ideals of workmanship. For example, when a girl is preparing to make an apron she should be given an opportunity to examine a number of well-designed, well-made aprons. Or when a boy is about to make plans for a Morris chair he should study several such chairs. If the pupils can have the guidance of the teacher in the study of models so much the better. *Second,* models may be valuable as guides in the practice of special exercises. In woodworking shops there should be models of sawing, planing, squaring face by face, joining, etc. In

the sewing room there should be models of seams, hems, gathers, buttonholes, patching, darning, and the like.

Plans.—Whether work in manual arts and industries has intellectual value depends much upon how and by whom the planning is done. This at once suggests that the maximum of educative value is attained when the pupils work out their own plans as independently and as completely as possible. This does not mean the pupils are to be turned loose upon new lines of work without suggestion or direction of any kind; rather, that the planning should proceed somewhat as follows:

First, there should be, according to the nature of the work, a general discussion of the aims and purposes of the work, and of the materials to be used. This applies very generally to all kinds of manual and industrial undertakings. If the nature of the subject permits, there may be, in this connection, an examination and comparison of various samples or models.

Second, with the aid of the teacher, general plans should be worked out, usually by the class as a whole.

Third, each individual should work out his own plan in writing, with drawings when these are necessary, and submit it to the teacher for criticism and suggestion. Special care should be taken to secure originality in plan.

Fourth, after the plan is approved the pupil should still feel free to change his plan, but only with the approval of the teacher.

Supervision.—We say, "children will be children."

Would it not be better to say children *are* children. One of the dominant impulses of childhood is the impulse to play. This impulse is strongly stimulated by contact with other children even unto the days of maturity. In the shop, the sewing-room, or the kitchen the usual restraints of the school seem to be somewhat relaxed. For these reasons in themselves there must be constant and alert supervision of class work of this sort. But this implies only negative supervision. The delight in and value of the work are largely due to the fact that the pupils are constantly meeting unfamiliar situations, facing new difficulties. They continually need judicious guidance and help. The reasonable demands of a small class for help often tax the skill and energy of the most efficient teacher.

When the members of a class are working upon similar projects much time and labor may often be saved by anticipating some of the common difficulties and giving such suggestions as will enable the pupils to meet them when they encounter them. This plan must be used sparingly and with great discretion. There are few greater mistakes in teaching than that of standing before a class and *talking* when the pupils are eager to *do things*.

One other precaution is necessary. Some one has said, "It is not much learning, but much interference that makes the pupil mad." When a pupil feels that he knows what he is doing he does not wish to be checked.

Unnecessary criticism irritates and discourages him. Even when he is not doing just exactly what is best, from the point of view of the teacher, it may be better to let him go on until he discovers his own error, unless the experience is likely to be very costly in time or material.

Cooperation.—One of the socializing influences of work in manual arts and industries arises from the opportunity such work offers for cooperation. In projects of considerable magnitude, especially when undertaken in the interest of the school, or for some other purpose of common interest, a number of pupils work together, each doing a part. In such cases, however, each pupil should thoroughly understand the whole project, and, so far as possible, be interested in it as though it were all his own. When this is done in the right way it tends to develop the true social spirit; the spirit that is the basis of all interest in community life.

There is also a minor form of cooperation which has its value. Sometimes a pupil has a project in which he needs a little temporary help from time to time. Where the right attitude prevails pupils may safely be encouraged to exchange help at such times without special permission. Or, when the instructor is very busy, a pupil may apply to another pupil for criticism on his work or for guidance when in doubt.

In this connection two precautions are necessary. First, the aim of each pupil should be to promote the interest of all to do nothing that will hinder or unneces-

sarily interrupt another. Second, group projects must not occupy so much time that the naturally strong individual interest and motive is lost.

Rewards and Incentives.—In general, owing to the nature of the work in manual arts and industries, special rewards and incentives are unnecessary. Pupils not only wish to do the work, but they usually take pride in trying to do it well. Where these conditions prevail artificial stimulation is as unnecessary as it is to the appetite of a healthy, growing boy playing or working in God's out-of-doors. There are cases, however, where certain forms of special rewards and incentives have value and a legitimate place.

Exhibits of Work.—Shows, exhibitions, expositions of various kinds have become a part of modern civilization. Farmers show their grains, fruits, vegetables, and live stock. Manufacturers exhibit their products and sometimes their processes. Nations spend immense sums to place their resources in expositions. It is quite proper that boys and girls should be encouraged to make periodic displays of what they produce. There seems no valid objection to this incentive to pupils to do their very best, and the exhibit is sometimes a means of securing fuller sympathy and cooperation on the part of parents, school officers, and the community in general. It should not be necessary to add that every care should be exercised to secure genuineness in every part of the exhibit.

Prizes.—Educators generally discourage the giving

of special prizes for evidences of success in study. The writer is entirely in sympathy with that view of the matter, but feels that, in some respects, the case of manual arts and industries is different, and that, in the promotion of this great educational movement, exception may reasonably be made. For example, there seems no good reason why the members of a "corn club" should not make exhibits of their products at the County Fair, or elsewhere, and compete for prizes the same as their fathers do. Then, if this be a good wholesome experience for the boys, why should not the girls make displays of their work in household arts to be judged for prizes, and the boys exhibit collections of shop work?

Sale of Products.—When pupils produce articles of value they should, if they wish, be allowed to sell them. In some cases it would be a good thing for teachers to consider the probable commercial value of the projects they assign to their classes. Could this thing be sold, and for how much? would often be good questions to ask the teacher.

This principle has its limitations. It must be understood, of course, that it does not apply to work by young children. They should generally not be expected to produce things of commercial value. But when pupils are old enough to cultivate a piece of land they should be allowed to sell as much of the product as they like; and in some more advanced manual arts work pupils should be encouraged to make things that are saleable.

CHAPTER XVI

Summarizing the Tentative Answer to the Problem

In beginning the book I tried to make it clear that there is, in the minds of educators, a real problem as to the significance and place of manual arts and industries in a system of education; that our present system is generally lop-sided, over-literary, impractical, and lacking in interest and personal motive to the majority of pupils. Having shown that there is a real problem, I stated it in its three-fold aspects: first, the major question, what are the educational values of instruction and training in certain lines of manual arts and industries? second, in what part of the school course, and to what class of children is this training relatively most important? third, what general methods of training should prevail in order to secure the maximum of education values?

It should be clear to the reader that Chapters II to XIII inclusive are, throughout, devoted to the first phase of the whole problem, and that each of the minor phases is treated in a single chapter. It is not assumed that this is the ultimate solution of the problem, rather that it contributes somewhat to the *working knowledge* that makes progress toward the solution possible.

HISTORICAL PERSPECTIVE.

The historical chapter aims to give a perspective view of the whole matter. The brief statements regarding Egyptian and Hebrew civilization suggest the significance of manual arts and industries in racial evolution. This view may be clarified and enlarged by the study of any early civilization, or of any primitive people. What is given is intended to point to the fact that in a very real sense man has lifted himself by his hands.

Moral Reform.—The movement to make training in certain industries a part of school work is at least 400 years old. Martin Luther advocated it as a means of moral reform, pointing out that skill and industrious habits conduce to self-respect, self-reliance, and self-support, and that inefficiency leads to idleness, and idleness to vice and crime. This view was urged by many moral and religious reformers in different countries for many years.

Wider View.—Gradually such educational reformers as Comenius, Pestalozzi, and Froebel enlarged the conception. They saw in manual activities the natural medium for the expression of the child's impulses to self-activity, a means of utilizing especially the impulses to motor activity, a means of giving children real first-hand knowledge of things, as well as some skill and a right attitude toward manual work.

Progress in America.—In America the introduction

of manual training had, for some years, mainly a vocational motive. That was in itself a good motive, and the promoters of the movement deserve unstinted praise for what they did. Gradually, however, a broader view has developed and, to some extent, been applied. It is seen that motor activities are relatively more important to young children than to those of high school age, that among the most educative forms of motor expression are the various kinds of manual arts and industries appropriate to the different stages of development. According to the present trend of the movement the vocational aspect, in secondary schools, is entitled to much more attention than it now receives; but vastly more, the non-vocational training in manual experiences in elementary schools needs careful study and strong emphasis.

History shows the value of manual arts and industries as means of human development.

FUNDAMENTAL MEANING

We have come to understand education as the process of reorganizing experience in such a way as to develop appreciation and conservation of the things of most value in the life of the individual and of society. Now, experience is primarily an individual, personal thing. It is the reaction of the individual upon his environment. It is the immediate product of self-activity, and all self-activity is prompted, impelled, by some impulse, some conscious or unconscious sense of need, some desire to

acquire power to control things or to possess things that seem of value.

Modern pedagogy recognizes that these fundamental impulses should have opportunity for expression, should be directed and utilized in such ways that the immediate experiences are valuable in themselves and, at the same time, that they develop right attitudes toward subsequent desirable experiences.

The Impulses.—In relation to our problem we considered such fundamental impulses as the general impulses to activity, the impulse to get sense stimulations, the impulse to motor activity, to play, to imitate, to construct or to make things, to experiment or see what things will do in different conditions, the social impulse, the aesthetic impulse, the ownership impulse. To these, perhaps, we might have added the impulse to think and to work. These are all united in the general impulses to activity, with a view to solving problems, satisfying needs, attaining desired controls.

Relation to Manual Art.—Each and all of these important and varied impulses find peculiarly favorable and appropriate opportunities for expression in the various forms of manual arts and industries that may be introduced into the school. Social and economic conditions have, within a few years, so changed, that, to a very large extent, these opportunities have been eliminated from the life in the home. The school is maintained as the

complement of the home. It is the business of the school to supply, so far as possible, the valuable experiences that are not supplied in the home.

The nature of the young child demands for his best all-round development regular, systematic, varied experiences in manual arts and industries.

SENSE TRAINING

Importance.—Educators agree in recognizing the importance of training the various sense powers. So vital has this been considered that, in the mistaken belief that one power could best be isolated and trained alone, various schemes, such as object lessons and special sense-training exercises, have been devised and carried on for a time with great enthusiasm.

The Natural Method.—Whether this matter is considered from the point of view of evolution or from that of the development of vocational skill, it appears that the power of sense discrimination is best developed when the senses are exercised not directly for the sake of the sense distinctions alone, but as a means to the attainment of some end of value in itself. Moreover, it appears further that the total result of special sense-training exercises, if carried on extensively, may be arrest of general development. On the other hand, in work in manual arts and industries there is abundant training of sight, touch, and of the muscular sense, under conditions that ensure a right attitude toward the experience and

keep the different elements of experience in their appropriate relations and true perspective.

Manual arts and industries afford the natural and effective means of sense training.

DEVELOPMENT OF MOTOR CONTROL

Equally fundamental with sense training in human development is the development of motor control. It is impossible to conceive of development or efficiency in human life apart from motor control. No argument or evidence is needed to satisfy us that regular, systematic training in manual arts and industries develops such control. The purpose of that part of our investigation was to determine the conditions under which such control develops most rapidly and to discover the relation of the motor activities to other accompanying activities.

The Dominant Factor.—The conclusion that *attention* is the dominant factor in the development of motor control is most significant. Remembering that attention involves all modes of intellectual activity we see the relation of manual activities to mental development. A mental activity must accompany and guide every conscious manual activity. There must be coordination and cooperation among brain cells before there can be cooperation between nerve and muscle. *Practice without attention is folly.*

Effort.—The connection between concentrated attention and strenuous effort will be evident, and the impor-

tance of this connection should be carefully considered. To require children to strive for a certain kind of motor control, such as writing with a fine pen, before they are physically ready for that kind of experience, is likely to result in more or less permanent disability to acquire ease and skill in that control.

Frequency and Regularity.—The value of frequency and regularity in practice was clearly demonstrated. And the importance of training in large movements first, and then of gradually reducing the amplitude of the movements, hence of the nervous and muscular areas involved, was clearly implied.

Training in manual arts and industries is an obvious means of developing motor control, but the dominant factor in the process is concentrated attention.

Normal development proceeds from large to small areas among nerves and muscles. Young children should not use small materials or fine instruments.

PHYSICAL AND PHYSIOLOGICAL RESULTS

Education has been defined as the development of the central nervous system. One condition of this development is exercise of the system appropriate in kind and amount. Every effort to do something not done before tends to establish new connections among nerve or brain centers, to bring undeveloped cells into functioning activity, and to strengthen structures already formed. This condition is especially important during

the first twelve or fourteen years of life, and still very important until maturity. During the early years there should be a great variety of experiences. The child should try to do many things, should learn something of many things, should not strive for a high degree of skill in any one form of activity.

In early life motor activities naturally predominate over the reflective, but for every muscular activity there is a corresponding change in the nervous system. Moreover, physical activity is essential to the healthy development of the brain and nerves as well as of the rest of the organism.

Manual arts and industries supply the occasion for a great variety of experiences, both motor and mental, and hence develop the whole nervous system.

INTELLECTUAL RESULTS

In this summary the relation of training in manual arts to sense training has already been pointed out. The intellectual value of this is obvious, but there are other important intellectual results. Under right conditions every step in the work demands attention which exercises every mental power. All these mental and motor activities tend to the development and organization of the nervous system for more effective work with both hand and brain. Especially is it true that the experiences in hand-work, including the study of related materials and objects, supplies a wealth of varied images

available in constructive imagination. Then, too, the extensive first hand acquaintance with many materials, as they are brought into working relations, exercises and gives the best basis for *practical judgment.* Finally, the very nature of the work in the shop, on the farm, in the kitchen, or the sewing-room, when done under right conditions, necessitates more or less *reasoning,* that "purposive thinking" in the interests of a plan, a problem to be worked out, a difficulty to be removed.

Rightly conducted, manual arts and industries furnish abundant exercise for all forms of intellectual activity, under conditions most favorable to mental development.

AESTHETIC SIGNIFICANCE

Apart from manual arts the art work in our schools is largely isolated, is unrelated to other activities, lacks a genuine motive. Construction work and various forms of industrial occupations give real occasion for the use of representative drawing, for design, for mechanical drawing, for studying color, decoration, etc. The desire and the attempt to use art leads to genuine study of the subject, both in school and out. Interests are developed that are abiding and operative throughout life.

Work in manual arts and industries gives real motives for studying and applying art, and develops abiding aesthetic interests.

ETHICAL VALUES

Whether hand-work in the schools has ethical value depends largely upon how the work is done. If the work is always genuine, free from sham and pretense, if pupils are held strictly responsible for regular attention to, and prompt completion of their work, the results cannot fail to be morally wholesome. The advantage of manual work over book work in this respect is that failure in the former is more easily known than in the latter. This is especially true in regard to the thorough completion of an undertaking, where exercise of the will is especially involved. Moreover, if the manual work is continued far enough in the school course it tends to develop a habit of industry and a right attitude toward manual labor.

Under right conditions, training in manual arts and industries has important ethical values.

ECONOMIC AND INDUSTRIAL EFFECTS

Schools Lopsided.—To think of a school is to think of books. One who has had much schooling is expected to be a scholar. This shows the ideal of the school that has prevailed. It is traditional; the work of the early schools was almost wholly literary, but then schools were for the few. Conditions have changed; our public schools are for all the children of all the people, and they must provide for much more than did the early school. The school of the future must provide all necessary experiences that are not provided in the home life.

Important Changes.—Changes in social, economic, and industrial conditions have eliminated many activities in the way of manual arts and industries from the home. These have important educational values and the lack in the home must be supplied by the school. So far as the pupils are concerned this is easy, because they want it. Countless thousands of boys and girls leave school early because they tire of book lessons. These would remain in school and do all necessary academic work, if only they had a chance to do other things that seem to them more worth while.

A Far-reaching Movement.—The significance of this movement cannot now be estimated. With a saner curriculum for the elementary school, more interesting and attractive to the pupils, it should be easy to keep nearly all children in school regularly until they complete the elementary course. Beyond the elementary school the work should gradually take on a distinctly vocational aim for the majority of students. Besides studying literature and history for culture, the boys and girls should be learning to do with intelligence and skill the very things they will probably have to do all their lives. The work in science, for example, should relate directly to cooking, to agriculture, to typical manufacturing processes.

Above all, the secondary schools and colleges of the future will be adjusted to the needs of those boys and

girls who must devote much of their time to helping with the work at home, to earning their own support, or helping to support others dependent upon them. Under some such plan as that of the European "Continuation Schools" it would be easily possible for boys or girls over fourteen years of age to work their way through high school and college, getting a better training than most students now get in those schools; to learn thoroughly some trade, business vocation, or profession, concurrently with the school work; and to earn enough to support themselves during the time. In this view it is understood that the vocation of the girls is likely to be home-making.

This plan, of course, will eliminate much of the alleged cultural material from the high school and college courses these students take, but it will relate the work in science, mathematics, etc., much more intimately to the actual life interests of these students. Things will not be studied for the recitation, for the examination, or for the credits, but for their use in the practical affairs in which the student is engaged.

Manual arts and industries in elementary schools, leading to vocational work in secondary schools, will identify school activities with other life interests.

SOCIAL RESULTS

The plans here outlined should tend to develop more intelligent, skillful and efficient workers in all lines. Workers are esteemed and remunerated according to

their knowledge of their work and their skill in execution. Both these conditions will tend to raise the social status of the worker and to break down class distinctions. Better incomes for working people in both city and country will allow more time and money for literature, music, and other forms of art, and this in turn will have its effect upon the social life of the people.

Extensive training in manual arts and industries will tend to improve the social life of working people.

CONCLUSION

If the tentative conclusions reached in this study are in the main right, the meaning of manual arts and industries in education is most significant and far-reaching. It means that we must thoroughly reorganize our school curricula, elementary, secondary, collegiate; that, instead of spending nearly all of their time sitting at desks, working over books, pupils will spend about half of their time in some kind of work room, or in gardens or fields; that, after pupils have attained a certain maturity, the educational system will provide that they may work for pay half the time and pursue academic studies during the other half; that the vast majority will continue in school years longer than they do now; that among the masses of the people in industrial and commercial life there will be a constant rise in intelligence, in physical vigor, in economic efficiency, in prosperity, in moral stamina, in aesthetic interest, and in joy and satisfaction in life.

CHAPTER XVII

Suggestions for Courses of Study

It does not seem possible to make a course of study, or courses of study, in manual arts and industries that would be equally valuable in different sections of the country, or even in different schools in the same locality. Certain lines of the work represented in the course should be related as intimately as possible to home and community life with which the pupils come in contact. As these conditions vary in different sections of the country, and in different communities, so must the course of study vary if the work is to be most interesting and educative.

But, there are certain interests and activities that are more or less common in all communities. These will constitute a basis for a general suggestive outline which may be filled in and supplemented as necessary or desirable for local conditions.

First, there are certain lines of early racial industrial activities that have historical as well as manual art values, and that appeal to the combined play and constructive impulses of children. In their proper time and place, and within common-sense limitations, these have educational value for all children, and hence should find a place in the course of study. For example, the making of simple textiles and pottery were among the early efforts

of the man to utilize the materials of his environment. Rushes and coarse grasses were everywhere available for the simple mats, and clay could always be found for making the "coiled" bowls or pots. In either of these processes no tools were needed. They were genuine hand-made articles.

To trace the discoveries and inventions in connection with the development of these and similar arts and industries, from their crude beginnings down to present day process, reveals important stages in the progress of the race in acquiring control of environment. Moreover, the evolution of any one of the industries carried along with it, to a greater or less extent, the evolution of the natural sciences, mathematics, and art.

MANUAL TRAINING IN ELEMENTARY SCHOOLS

First Grade.—The work of this grade should especially center largely about the activities of the child's home life, should be mainly "play-work." As much as possible, for some weeks or even months, various kinds of work should be correlated about some unifying interest. For example:

1. Children make dolls' playhouses out of dry-goods boxes, or a number unite in making and furnishing one house.

   (a) Furniture is made of light wood or pasteboard, glue being used for joining.

(b) Simple rugs are woven from rushes, grasses or very coarse yarns.

(c) Lessons in drawing and painting are applied to making wall papers.

(d) In some cases the pupils will be able to make their own curtains.

2. If there is a period devoted to the study of a primitive people, for example, the North American Indian, there should be a similar correlation, such as:

(a) The representation of an Indian home, or better a small village, on the sand table.

(b) Construction of wigwams.

(c) Making canoes of bark, or cardboard.

(d) Placing evergreen twigs to represent forest.

(e) Modeling in clay the figures of Indian men, women, and children engaged in typical occupations. Modeling, also, some wild animals.

(f) Making spears, tomahawks, bows and arrows, hunting knives of stone, a stone corn mill, etc.

3. Representation of some typical industry, such as the production of bread.

(a) Making primitive spades or a plow, and harrow.

(b) A wooden reaping sickle, or a scythe.

(c) A flail.

(d) A sieve.

(e) A mortar or stone mill.

(f) A baking stone.

4. The approach of Christmas offers a strong incentive to construction work. The children may be allowed

several weeks to select, design and make, with special care, articles to be given as Christmas presents.

5. In the early work with wood there should be an introduction to (a) the study of trees; (b) the process of making lumber; (c) the physical qualities of different woods.

6. "The Story of Ab," or "The Tree Dwellers" by Miss Dopp, might be made the basis of studies in primitive life, and the Indian life left for the second grade.

Second Grade.—The general principles governing the work of this grade are the same as those for the first grade, the subject matter being determined by the life and environment of the children.

1. The historical work should center about the life in the pastoral and early agriculture periods, somewhat as follows:

(a) The story of how men came to domesticate animals. Why sheep and goats were among the first domesticated.

(b) Examination of part or the whole of a fleece.

(c) Experiments in primitive processes of washing, combing, dyeing, and spinning wool.

(d) Designing and weaving a blanket for a doll's bed.

(e) Children construct their own simple wooden hand looms.

2. Social projects.—Children of this grade may make,

of wood, some things for use in the school room or in the school garden, and the possibilities of Christmas gifts are enlarged by the increased skill of the children. Raffia table mats, simply embroidered burlap mats, pin trays modeled in clay and finished with a simple glaze, are suitable projects.

3. Playthings.—Because play still makes up so large a part of the life of the child the impulse to construct should be directly connected with the play impulse. Both boys and girls should be encouraged to make kites, tops, whistles, marbles, boats, bows and arrows, bird houses, etc. In addition the girls should dress dolls and model dishes of clay for the doll's house.

Third Grade.—If third grade children have access to a wood-working shop, they may begin to make systematic use of such tools as the saw, hammer, plane, rule, try-square, brace and bit, gouge and mallet, spoke-shave, and wood file. On the historical side, projects may center about the beginning of commerce and transportation.

1. The pupils convert a large box into a store, put in a counter and a few shelves and samples of staple goods, or boxes labeled to represent the goods. They construct balances to weigh articles, and rules with which to measure.

2. In connection with the study of transportation they make boats, sleds, carts, wagons, freight cars, tracks, bridges, etc.

3. For the home or school.—Pen-racks, trays, paper knives, desk-boxes, paper-files, portfolios, etc.

4. Playthings.—Houses for pets, wind mills, water-wheels, cross-bows, base balls and bats, balloons, etc.

5. Other lines of work.—Basketry, pottery, and textiles within the power of the children.

Fourth Grade.—Historically, the fourth grade work will commonly run into the colonial period, and this should form the basis of some of the handwork.

1. One group of children make a settler's log cabin. It should be, in miniature, a real log cabin, with fireplace, loft, chinks filled with clay, etc.

If the class is large a second group may build a blockhouse, enclosed by a stockade.

Some furniture of colonial types may also be made.

The problem of clothing is a good one to work over at this time. Spinning wool, cotton, or flax; weaving on hand or foot power loom; knitting; netting; sewing.

Other industries.—Making sugar, candles, soap, etc.

2. Projects of immediate present day interest: Playthings, things of use in the home or the school; e. g., a hen coop, a house for a pet, a hammock, a raffia basket or hat, a bow and arrow, a sail boat, a key rack, a cross-bow, a fern stand, a window box, a letter opener, a coat hanger.

Fifth Grade.—The work from the fifth grade on will depend largely upon what previous training the chil-

dren have had. If they have had but little training selections should be made from some of the more typical forms suggested for earlier grades. Otherwise they should go on to projects requiring more technical skill, but following the same general principles, that the work be intimately related to the lives of the children in the home or in the school.

1. Woodwork may include such articles as a bread-board, a box kite, a nail box, a bracket shelf, a milking stool, etc. Simple working drawings should be made.

2. In pottery such articles as fern-dishes, simple vases, candlesticks, and trays are suitable for this grade. At this stage the pupils may decorate their pottery with simple cutting and coloring. Articles should be glazed and fired from this time on.

3. Sewing should occupy the girls while the boys are in the shop. As in other work, the pupils should, with guidance, decide what they wish to make, plan the work, select the material, and generally possess what they produce.

Sixth Grade.—The same general principles should prevail as in the fifth grade work.

1. Woodwork.—Sun dial, weather vane, waste basket, teapot-stand, picture frame, any simple piece of furniture.

3. Sewing.—Aprons, dust caps, bags, sofa-pillow

2. Leather work.—Pen wipers, card case, book cover. covers, simple garments.

4. Metal work,—candle shade, hall lamps, pin tray, pencil tray, bowl. Materials and tools: thin sheet copper or brass, band iron, binders; hammers, mallet, blocks, files, pliers, snips, small iron vise.

5. Mechanical drawing should be taught so far as needed in plans.

Seventh Grade.—The work of the seventh grade should aim especially at increased technical skill. If work corresponding with that previously suggested has been done, the seventh grade may undertake something like the following:

1. Woodwork,—a mission chair, table or desk. This should involve accurate working drawings and a study of different methods of wood-finishing as well as skillful construction.

2. In the rural school the woodwork may relate more specifically to farm needs; e. g., a double tree, a farm gate, making a brace or a rafter, a wagon box.

3. The work of the girls should at this stage become distinctly specialized in domestic arts and sciences. See other courses following.

Eighth Grade.—In this grade boys should make one good piece of furniture, study and test other methods of staining and finishing wood. Wood-carving may also be begun.

Boys in the country should have some forge work, learning to mend a chain, sharpen a plow iron, cut a

thread on a bolt, etc., to the end that they may be able to make ordinary repairs on farm implements.

Girls should make a special study of house sanitation and decoration. See other courses.

DOMESTIC SCIENCE IN ELEMENTARY SCHOOLS[1]

Fifth Grade.—Study of home industries, comparing colonial times with the present.

Cooking: cereals, cranberry sauce, cookies, soups, hominy, corn-pone, bake beans, brown bread, apple-butter, doughnuts, pumpkin pies, and gingerbread.

Science: Study of corn as colonial grain; early methods of preparation; samp making; use of germ, hull and starch in corn; wheat; graham and white flour; visit to mill; composition; use of starch, gluten, and bran. Experiments show how flour holds a gas; soda and baking powder as sources of gas; acid and alkali.

Sixth Grade.—Study of yeast, mould and bacteria in relation to food; its preparation, preservation, and manufacture.

Canning, preserving, jellying, cooking vegetables, pickling of fruits; making butter, cheese; manufacture of cider and vinegar; making bread and biscuit; study of yeast, mould, and bacteria; conditions of growth, food, temperature, and moisture; observation under microscope; products of fermentation; acid and alkali (continued from fifth grade); gases in expansion; visit to bakery.

Seventh Grade.—Study of different foods lead-

[1] Adapted from University of Chicago Elementary School Announcement, 1908-9.

ing to a simple classification as, (1) carbohydrates, (2) fats, (3) proteids; temperature effects on each food; principle and work in cooking based on the composition of the food.

Cereals, cream sauce, croquettes, cream soups, corn starch desserts; egg cookery, custards, salad dressings, ice cream, divinity creams; fish and meat.

Study of heat: thermometer, Centigrade and Fahrenheit; cause of change in boiling-point; comparison of materials as conductors of heat; transmission of heat in solids and liquids; study of freezing temperature.

Eighth Grade.—Study of home-making in all its varied aspects: conditions of a good site; what constitutes a good basement; plans for first and second floors, with special consideration of kitchen, pantry, and dining room management; study of warming, lighting, plumbing, and ventilating; how to keep the house clean; the relation of dirt to disease.

House furnishing and decoration. Appropriateness in color schemes as applied to furniture, rugs, and wall decoration.

The School Garden or Farm

Purpose.—The school garden or farm has many elements of educational value. It affords opportunity for the expression of the child's impulses to play with soil, to plant things and see them grow, to produce something distinctly his own. In so far as soil and plants are concerned, it provides the best conditions for nature study. It tends to develop the true workmanship attitude and

habit, because the real end of the activities is necessarily remote. The experiences not only give valuable first-hand knowledge covering a wide range of subjects, basal to all the sciences, but they open to view the marvellous possibilities of intelligent work in the various phases of agriculture.

Size.—The size of the garden or farm depends upon local conditions. For a city school, or a small country school, a plot containing from 100 to 500 square yards is valuable. The more the better, providing it is well utilized. A large rural school should have from one to three acres, and a consolidated rural school or an agricultural high school can well use from five to ten acres.

Divisions.—Whether large or small the garden should be subdivided so that each pupil has an individual plot. When space permits there should also be some plots for group work along certain experimental lines, such as seed improvement, plant propagation, fruit growing, fertilization, etc.

Fertilizing.—Except in rare special cases no attempt should be made to raise a crop without the application of fertilizing material. This should be discussed with the pupils and the kind and amount of fertilizer decided upon. As the work proceeds experiments may easily be conducted to show value of fertilizing and what kinds of special fertilizers are best for particular soils. The main point, however, is that when crops are taken from

the soil, that soil becomes poor unless materials for plant-foods are returned to it in a form that the plants can take up.

Spading or Plowing.—As much as possible of the work should be done by the pupils. A number of large boys can spade a large plot in a few hours, and there is no reason why they should miss such excellent physical culture. The large boys should do this work for the smaller pupils. When, however, the plot is large, it should be plowed, the pupils witnessing the process and some, if possible, taking part. The value of deep culture should be studied in connection with plowing, fertilizing, and length of plant roots.

Planting, Weeding, and Cultivating.—Planting involves a study of depth, spacing, including ultimate thinning or transplanting. Pupils should early learn that one good strong plant, well nourished, is better than two weak, half-starved ones.

Weeds are highway robbers to the cultivated plants. They are usually stronger and more vigorous than the desired plant. To "grow like a weed" is proverbial. Hence they get most of the plant food where they have a chance. The children should learn that it is easier to destroy a little weed than a big one. For every reason, therefore, the ideal of a "weedless plot" should be held before the pupils.

Many confuse cultivation with the destruction of

weeds, because cultivation does destroy weeds. Its real purpose, however, is to open and stir the soil, to let the air and warmth in and unfavorable gases out. The only precaution necessary is that the cultivation does not interfere with the spreading roots of the plants.

Watering and Vacation Care.—In most localities, in the early season, it will be beneficial to the young plants to have more water than is supplied by the ordinary rainfall. Pupils should be taught how and when to supply this need. Another problem is that of caring for the garden during vacation. This problem should be understood from the outset and, if possible, pupils should be held responsible for their individual plots. Where each plot is small a half-hour once a week will be sufficient to keep it in good condition. If some pupils are to be away during vacation, they may arrange with others to care for their plots. As a last resort, the janitor or some one else may be hired to do it. A neglected garden is demoralizing.

The Crop.—It is expected that the garden will produce things that are worth while, hence it follows that the products should be used. If some pupils in a particular year grow only flowers, the flowers should be cut and used to decorate the school room, taken home, or sent to a hospital or other worthy place where they will be valued, or, if the grower wishes to sell them, he should be free to do so. Vegetables and fruits should be gathered at

the proper time and used or disposed of as in the case of the flowers. It is sometimes a good plan to have pupils estimate the value of their product. In a very real sense, neglecting all other conditions, the pupil who produces the most value on his plot is the most successful farmer.

Special Problems.—In so far as possible, each pupil should have some special problem to work out, beside merely trying to get something to grow. Some may divide their plots into two or three equal parts and test fertilizers. Some may cross-fertilize two varieties of corn or other plants and develop a new variety. To merely select the best seed each year for three or four years and watch results is sufficiently interesting. A small plot may be utilized as a nursery where different methods of plant propagation may be tested. Older pupils may make and experiment with a hot-bed.

Domestic Economy[1]

Cooking.—Study of carbohydrates, proteids, fats and their combinations, with methods of cooking the same. Marketing. Preparation of foods. Cooking of fruits, meats, vegetables and making of salads, pastry, puddings, cakes and ices. Serving of food. Canning and preserving. Adulterants and preservatives. Invalid cookery. Care of kitchen and kitchen utensils. Required throughout both years for girls.

[1]These courses in Domestic Economy, Manual Training, and Agriculture are those of the Winnebago County School of Agriculture and Domestic Science, Winneconne, Wisconsin.

Sewing.—Underlying principles of sewing, and use of sewing utensils. Darning, patching, and lace mending. Making of plain garments from ordinary materials. Drafting of patterns, cutting of material from patterns, fitting of garments and making and trimming of underskirts, drawers, corset covers, shirt waists, muslin dresses and shirt waist suits. Required throughout both years for girls.

Millinery.—The fundamental principles of millinery will be taught. Each student will be required to make at least two hats. Required third term first and second years for girls.

Physiology; Hygiene.—The circulation of the blood, respiration, digestion, secretion, with the anatomy and hygiene of the human body preparatory to the course in Home Nursing. Required first and second terms first year for girls.

Home Nursing.—Lectures on the sick-room, the patient, the nurse, the care of the patient, administration of medicine, and external applications. Accidents, emergencies, and accidental poisoning will also be studied under this head. Required third term first year for girls.

Home Management.—Decoration, arrangement, sanitation, ventilation, heating, lighting and furnishing of the farm home. Required middle term second year for girls.

Laundry.—The composition and use of the various dyes, soaps, borax, bluing, and washing powders are studied. The fixation of colors, disinfecting, starching, polishing, special treatment of flannels and silks and special methods of removing stains. Required third term second year for girls.

Drawing.—A general course in drawing to teach the principles of perspective and the use of pencil, pen and ink, crayon and wash in the representation of ideas. Work in mechanical drawing to show the use of lines and conventions in drafting and design. Intended to enable pupils to understand and to draw designs, patterns of garments, and plans for houses, furnishings and grounds. Required middle term first year for girls.

Food Chemistry.—A study of starch, sugar, oil, glucose, proteids, with reference to the elements that enter into their composition, the changes that take place in their cooking and their combination into a "balanced" ration. A general study of organic chemistry. Required middle term second year for girls.

Drafting.—A few exercise sheets to teach the use of instruments and the general principles of drafting, followed by working drawings of the things to be made in the shop or on the farm. Practice in blue printing. Required first term first year regular course for boys, and first year short course.

Manual Training

Farm Mechanics.—A study of the simple machines and the principles of physics which have a bearing on the working of pumps, windmills, and other farm apparatus. Lectures and laboratory work on power and field machinery, and gasoline engines. Calculating speed of pulleys, horse-power of engines, etc. Lectures on road building and bridge construction. Practice in rope splicing and knotting. This course is designed to cover the many mechanical problems to be met with by

farmers. Required middle term first year regular course for boys, and first year short course.

Farm Buildings.—In this course the pupils design and draw plans for houses, barns, silos, and other farm buildings, and estimate the cost of construction. A study of the relative arrangement of the farm buildings will also be made. Required third term first year regular course for boys.

Cement Work.—A laboratory course in the methods employed in mixing cement, sand, and gravel for foundations, floors, walks, and bridges, together with practical demonstrations of, and lectures on, re-enforced concrete construction. Students will make cement fence posts, hitching posts, hog troughs, etc. Required first term second year regular course for boys.

Blacksmithing.—Heating, bending, welding, tempering, chipping, and filing are taught. Students are required to make hooks, staples, rings, chisels, and other things needed on the farm or in the shop. The principles and practices of soldering are also taught. Required third term first year regular course for boys and second year short course.

Carpentry.—The care and use of tools. The making of a series of exercises of wood, including farm apparatus and things useful about the home. Later opportunity will be given to construct mission furniture or some of the pieces of farm apparatus, as wagon boxes, work benches, etc. Required first and second terms first year and third term second year regular course for boys, and first year short course.

AGRICULTURE

Dairying (1).—Testing milk, cream, skim milk, and whey for butter fat by use of the Babcock test, and an application of these tests to individual herd and factory and creamery operations. Testing butter and cheese for moisture, fat, curd, and salt. Required first term first year regular course for boys.

Dairying (2).—Analysis of milk and its products. General principles of and study of the tests required in butter and cheese making. The use of the scales and Babcock test in determining the individual merit of the cows in the herd. Required middle term first year regular course for boys, and first year short course.

Insects and Plant Diseases.—A study of the way in which insects feed and multiply. Insects injurious to native fruits and to farm crops and the methods of holding these pests in check. The preparation and use of insecticides. Fungus diseases of plants and the methods of treating these diseases. Required for boys third term first year regular course.

Horticulture.—A general survey of the whole field of the science and art of tilling the soil, especially in preparation for garden and fruit crops, and a study of the plant life of the farm. General botany. Required for boys and girls first term first year regular course.

Agronomy.—History of the standard varieties of forage plants and the cereals, and methods used in their growth and in the development of new varieties. Grain judging by the use of score card. Germination test for seeds. Examination of grains for foreign substances and weed seeds. Rotation of crops. Required middle

term first year regular course for boys, and first year short course.

Feeds and Feeding.—Feed and fertilizing value of the different crops raised on the farm, and of the feeds on the market. The balanced, the narrow, and the middle ration, and the features of each. The effect of feeding various rations, and methods of calculating proper rations. Definition of terms, as carbohydrate, protein, etc. Henry's "Feeds and Feeding" outline followed. Required first term second year regular course for boys.

Stock Judging.—Score card work. Instruction in classification, buying, examination for soundness, and judging beef and dairy cattle, horses, sheep, and swine. Several judging trips to the noted herds of superb stock in this section of the state. Required middle term second year regular course for boys and second year short course.

Breeds and Breeding.—Class room work relative to the characteristics, qualities, history and capabilities of the various breeds of live stock, and a study of the principles that underlie successful breeding. Required third term second year regular course for boys.

Chemistry.—A study of general chemistry and the relation of this study to farm life, followed by a study of food stuffs, preservatives and adulterants, and methods of detecting same. Required first term second year regular course for boys and girls.

Bacteriology.—A study of molds, mildews, yeasts, and and bacteria with their relation to flavors in foods, keeping of canned goods, souring of milk, farm sanitation and

the prevention of disease. Required third term second year regular course for boys and girls.

Soils.—Formation and origin of soil. Conservation; the economic importance of it and the methods of conservation by crop rotation, proper use of barnyard manures, legumes and fertilizers. Classification and methods of handling different classes of soils. Conservation of moisture in the soil. Required third term second year regular course for boys.

Drainage and Fertility.—Advantages of drainage. Opens the soil, warms the soil, removes surplus water, conserves moisture, etc. Principles which underlie successful drainage, and methods. Formation of a drainage district, legal steps necessary, apportionment of cost, planning the drainage system, and use of level and plane table in mapping the area, Plant house work illustrating the relation of drainage and the conservation of fertility. Work with growing plants to determine the different fertilizing elements required by the growing crop. Required middle term second year regular course for boys, and second year short course.

Farm Publications.—A study of the selection of the books that would make a well balanced library in the farmer's home, and the best methods of securing same. Arrangement of the library. Selection and qualities of different papers and magazines suited to different lines of farming. The distribution of free bulletins, both state and the United States; and methods of selection from the published monthly list by the Department of Agriculture. Required middle term second year regular course for boys, and second year short course.

Farm Gardening.—A study of the practical and artistic arrangement of the farm garden, together with the best methods of cultivation of the different vegetables, fruits, etc., and the arrangement of shrubbery, flowerbeds, etc. Class room and field work combined. The school garden will be laid out and planted under direction of this class. Application of the principles of horticulture. Study of the fruits best adapted to this country. Required third term first year regular course for boys and girls.

High School Course in Household Arts and Economics[1]

The aim of the work in the Domestic Science and the Domestic Art Departments bears a distinct relation to the aim of manual training work in general. The aim is distinctly character building, and the careful guiding of the girl to happiness through the ability to do and express herself through home mediums. It aims to lead her to become a responsible being, ready to take the initiative when she faces the world and its requirements. The sewing, dressmaking, cooking, etc., presented are in no sense the end and aim; they are simply the means of attaining educational training. Because of the practical nature of the work, the girl is enabled to take up the duties of life in a more competent and intelligent way, and to become a home-maker in the broadest sense of

[1]Adapted from the course of the Hackley Manual Training School, Muskegon, Michigan.

the word. The courses of work given are but a help toward an "all-around" development that can be obtained in a large measure through the training of the motor activities along lines most closely related to home-making.

Domestic Art

First Year.—The aim of the course in Domestic Art during the first year is to make the girl more self-reliant and responsible, and to lead her to self-expression in all her work; the emphasis is placed on the educational training, not on the garment produced. The growing interests of the girl are considered.

Subjects considered:

1. Machine sewing, history of machines, comparison, use, care; practice stitching, tucking, use of gauge, tucker, etc.; drafting and making a pillow case and one undergarment.
2. Christmas work. Applied art decoration, simple stitches, outline, chain, Kensington, used in decoration of sofa cushions, table cloths, etc.
3. Drafting and making a second undergarment, consideration of economical planning and cutting of materials, study of quality, price, width and value of cloth. (Illustrated.) Consideration of appropriateness, decoration, etc. Calculation of amount and cost, comparison of value of hand and machine work. Talks on sweat-shop labor, bargains, hygienic underwear, etc.

Second Year.—The course planned for this year gives the girl an opportunity to express herself still farther as the work progresses in difficulties, and aims to correlate with home interests and to develop social efficiency. Special attention is given to the life problems of industry and labor.

Method—Individual work, discussion and demonstrations.

Subjects considered:

1. Drafting and making of shirt waist suit (skirt and waist). (a) Consideration of careful measurements. (b) Made from pupils' designs. (c) Discussion of suitable materials with reference to color, design, etc.
2. Christmas work, as suggested by teacher and pupils.
3. Ethics of shopping.
4. Discussion of hygienic dress and appropriateness in dress, with reference to economy, beauty and cleanliness.

The entire year of Domestic Art is devoted to sewing. The first part of the first three months is devoted to designing, drafting, cutting and fitting of the skirt. The month preceding Christmas is devoted to making simple gifts, suggested by the pupils and the teacher. During the past year, such articles as the following were made:

Turn-over collars, cuffs, handkerchiefs, bed room slippers, baby sacques, aprons, hand-bags, center-

pieces, etc. The gifts were simple and inexpensive, suggestions being made by the teacher to suit the purses of all. The remaining six months of the year are spent in making the shirt waist suit.

Third Year.—During this year the larger and more difficult problems in dressmaking are undertaken, and at the same time additional work along the art line, as applied to basketry, is continued.

Subjects considered:

1. Dressmaking—Drafting, and making of skirt. Talks on appropriate material, drafting, cutting, fitting, hanging and finishing of skirt, discussion of linings and trimmings,
2. Making an underwaist by hand, drafting, cutting and decorating. Talks on appropriateness, etc.
3. Textiles—Wool, cotton, silk, flax; their culture, manufacture; influence of industries on civilization.

Fourth Year.—The aim in the fourth year is to furnish opportunities for the creative genius of the student. Millinery is introduced, which develops a lightness of touch and a skill in handling, which such materials demand. The course trains the imagination and aims to cultivate a love and appreciation for the beautiful and artistic. The work of this year should form the basis of the study of home decoration, and will correlate with the courses in Domestic Science, House Sanitation, etc. (See fourth year course Domestic Science.) It is the aim to suggest to the girls the true beauty and atmosphere of a

home where economics mean the best and the most for the least expenditure of time, money and energy.

Subjects considered:

1. Fall Millinery. (a) Talks on color and textiles of use in millinery, wiring hats, making folds, bows, frames, binding, facing, covering hats and trimming. (b) Principles applied in study of line and form. (c) Attention given especially to color harmony and cultivation of artistic taste.
2. Applied art needle work (Christmas).
3. Spring Millinery: Making of wire frames, making of straw and raffia hats, trimming of hats.
4. Art needle work.

Domestic Science

First Year.—The course in Domestic Science is planned with reference to the interest of the girls. It aims to give them a knowledge of all the food principles in a concrete way; to make them acquainted with the use of kitchen utensils and contrivances and to cultivate a desire to be orderly and neat in all their work.

Subjects considered:

1. Fundamental food principles, (a) what foods are, (b) where produced. Study and practice in the cooking of starch, milk, eggs, meat, poultry, fish, soups, simple desserts, doughs and batters, and the preparation of salads, beverages, etc. Food adulterations, and preservation of foods.
2. Study of the action of heat, cold and fermen-

tation in the development of flavor and in the digestion of foods.

3. Cleanliness and order in work: (a) Proper handling and care of contrivances; (b) cleaning of stove, sink, refrigerator, utensils, dishes, etc.; (c) accuracy in measurement of materials; (d) estimated cost of the dish prepared at each lesson.

At the end of the first year the girl has a knowledge of the food principles involved in the cooking of soups, meats, vegetables, cereals and simple desserts, and she is expected to be able to serve the dishes she has prepared in a neat and attractive way.

Second Year.—The course of the second year plans to review the fundamental principles given in the first year, but in a more abstract way. Attention is given to the comparative value of foods and their composition, function and digestion. This course aims to make the girl more thoughtful in her work, to have her see the cause and effect in all she does, to understand the relation of the cost of food to other household expenditures and to teach her economy in the use of materials.

Subjects considered:

1. Fundamental cooking processes. Study of fruit, cookery, starch, water, milk, eggs, fish, meats, soups, desserts, yeast, baking powder and advanced cooking.

2. Composition and comparative value of foods.

3. Experiments, illustrating the growth and destruction of bacteria.

4. Dietaries—Planning and cost of menus with reference to proper food principles according to means of average family and locality. Serving of a meal (in group).

5. Table setting and serving, duties of hostess, duties and appearance of waitress, cost of furnishing the dining room, linen, glass, silver, etc.

The work is not entirely theoretical, for more than half of the time is spent in laboratory work. Part of the year's work is devoted to table-setting and the planning of meals, based on the scientific facts learned during the first three quarters. The year's work begins with canning and preserving, study of bacteria, etc.

Laundry Course (Twenty Lessons)

Third Year.—The third year offers to the student courses in laundry, emergencies, home nursing and invalid cookery. It aims to give her practical knowledge, which she can use intelligently in the home.

Subjects considered:

1. Discussion of laundry, care of its equipment, necessary utensils for home use where elaborate equipment is not available.

2. Relation of laundry to health.

3. Talk on fabrics and material used, such as soap, water, powders, etc.

4. Experiments to illustrate effect of hard and soft water.

5. Removal of stains.

6. Microscopic examination of fabrics, effect of laundrying, shrinkage, etc.

7. Discussion of fading, dyes, mordants, washing of colored materials.

8. Each girl will wash and iron one article illustrative of each principle involved.

9. Economic side considered. Visit to local laundry.

EMERGENCIES

1. Review of physiology.

2. Treatment of burns, cuts, fainting, drowning, poisoning.

3. Preparation and rolling of bandages, demonstration of their use.

HOME NURSING AND INVALID COOKERY

1. Twenty lessons in cookery.

2. Discussion of and demonstration: Duties of nurse at home, dress, arrangement of room, duties of trained nurse, duty to physician, making bed with the patient in it, change of bed linen, clothing, taking temperature, pulse, etc.; visit to hospital, its function discussed.

Fourth Year—The fourth year finds the student ready to consider the problems of sanitation, plumbing, heating, and ventilation, and architectural drawing.

The aim is to give the student a knowledge of suitable dwelling places, make simple plans and elevations. It aims

to develop thoughtfulness in regard to such essential considerations in the selection of a home as the relation to health, economy of time and labor, and appearances. The last half of the semester is devoted to a short course in chafing-dish cookery.

The close connection between this work and all that has preceded it, both in Domestic Science and in Domestic Art, is clearly impressed upon the student, and she is shown, in a broad way, the vital importance of, and the skill and knowledge required in home-making.

Hygiene and Sanitation

Discussion of health and appearance, and economy of time and labor in houshold work. Cleanliness—Individual, house, municipal. Work of Board of Health—Disposal of ashes, garbage, etc. Cleaning of household furniture—Rugs, rooms, paint, glass, bric-a-brac, tiles, floors. Microscopic examination of dust, etc.

Plumbing, Heating and Ventilation

1. Discussion of plumbing—Cleaning of traps, plumbing of building, drainage and sewers, etc., principles on which they are based.

2. Heating—Fire-places, stove, hot water, hot air, steam. Brief consideration of economical and convenient methods, proper fuels, etc.

3. Ventilation—Necessity of proper system, natural and forced. Effect on heating.

Architectural Drawing

Drawing of simple plans, elevations and details, proper location of house on lot and proper location of rooms. Planning, heating and ventilating systems based on previous study of these subjects.

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